

MACHINERY

Design—Construction—Operation

Volume 42

AUGUST, 1936

Number 12

PRINCIPAL ARTICLES IN THIS NUMBER

FOR COMPLETE CLASSIFIED CONTENTS, SEE PAGE 824-B

Progress in the Art of Metal Cutting is the theme of September MACHINERY—an unusual number dealing with cutting tools and cutting-tool materials. The shop practice of prominent manufacturers will be reviewed. The application of standard and of newly developed high-speed steels, as well as of Stellite and carbide cutting materials will be covered by men of broad experience. There will be side-lights on taps, drills, milling cutters, and other tools. The number will be a most comprehensive treatise on present cutting-tool practice.

What!—Riveting a Silent Operation?.....	By Charles O. Herb	761
What Do We Gain by Using Ground-Thread Taps?	By H. Goldberg	765
From White Hot Slab to a Strip of Sheet Steel in Two Minutes		766
Precision Operations in the Manufacture of Turret Lathe Spindles	By William J. Burger	769
Typical Applications of Roller Bearings to Machine Tools	By S. M. Weckstein	774
Four Different Die-Castings from One Set of Dies	By Charles O. Herb	779
Editorial Comment		782
Engineering Required in Manufacturing as Well as in Design— Advertising Tends to Reduce Prices and Raise Wages—Reciprocal Buying Does not Promote Good Salesmanship		
Boring, Facing, and Chamfering Gear-Pump Bodies.....		786
Quantity Production of One Hundred Different Parts by Two Machines		794
Dimensioning Assemblies and Parts from a Common Point	By C. W. Hinman	796
Measuring to Millionths Made Easy.....		800

DEPARTMENTS

Engineering News Flashes.....	780
Ingenious Mechanical Movements.....	783
Questions and Answers.....	788
Design of Tools and Fixtures.....	789
Ideas for the Shop and Drafting-Room.....	793
Materials of Industry.....	802
New Trade Literature.....	804
Shop Equipment News.....	807
News of the Industry.....	821

PUBLISHED MONTHLY BY
THE INDUSTRIAL PRESS
 148 Lafayette Street New York
 ROBERT B. LUCHARSPresident
 EDGAR A. BECKER...Vice-pres. and Treasurer
 ERIK OBERGEditor
 FRANKLIN D. JONESAssociate Editor
 CHARLES O. HERBAssociate Editor
 FREEMAN C. DUSTON ...Associate Editor

LONDON: 52-54 High Holborn
 PARIS: 15 Rue Bleue

YEARLY SUBSCRIPTION: United States and Canada, \$3 (two years, \$5); foreign countries, \$6. Single copies, 35 cents. Changes in address must be received by the fifteenth of the month to be effective for the forthcoming issue. Send old as well as new address.

Copyright 1936 by The Industrial Press. Entered as second-class mail matter, September, 1894, at the Post Office, New York, N. Y., under the Act of March 3, 1879. Printed in the United States of America. Member of A.B.P. Member of A.B.C.

Product Index 112-132

Advertisers Index 134

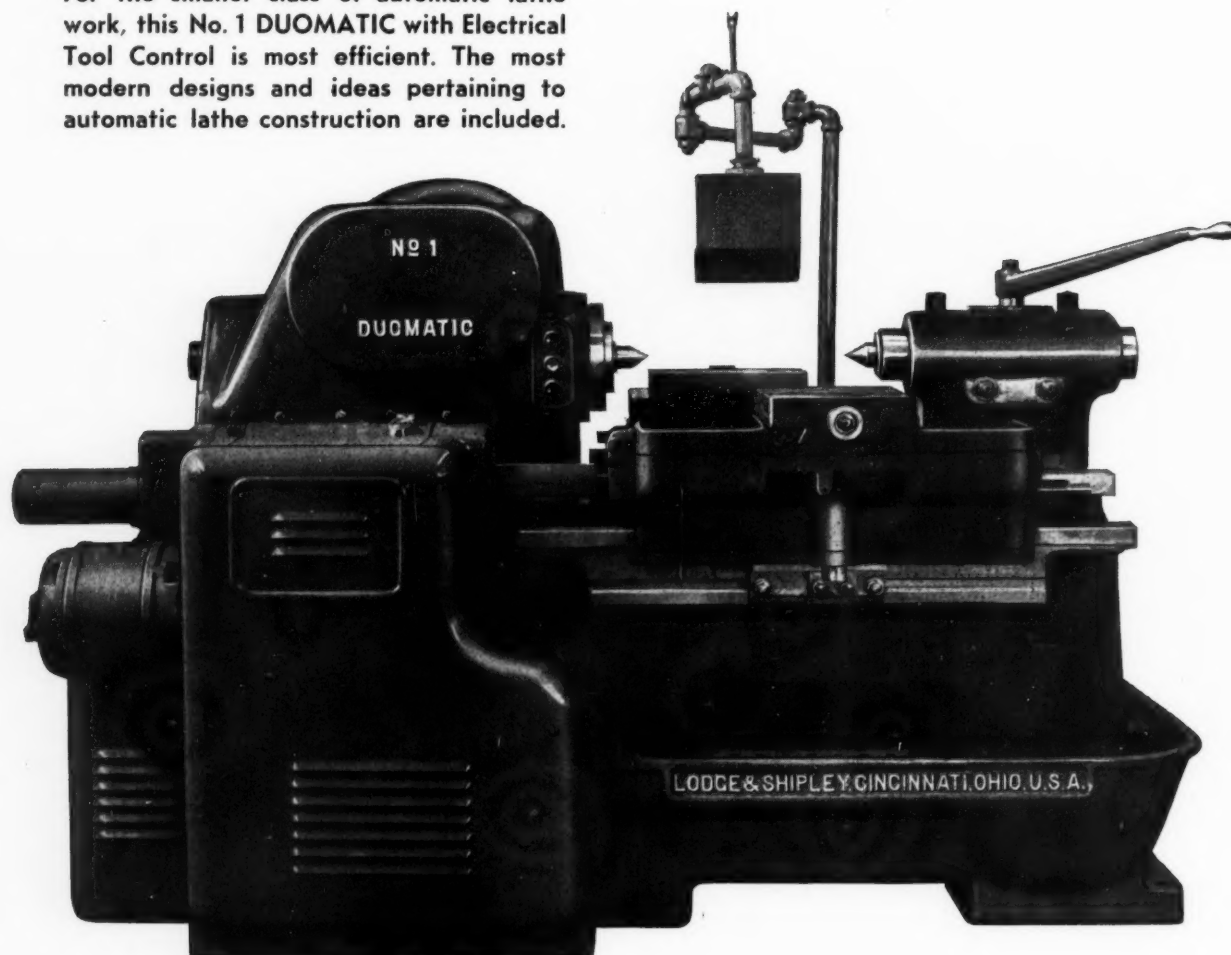
CIRCULATION 15,119

PROGRESS CREATES NECESSITY



NECESSITY DEMANDS CHANGE . .

For the smaller class of automatic lathe work, this No. 1 DUOMATIC with Electrical Tool Control is most efficient. The most modern designs and ideas pertaining to automatic lathe construction are included.



MACHINERY

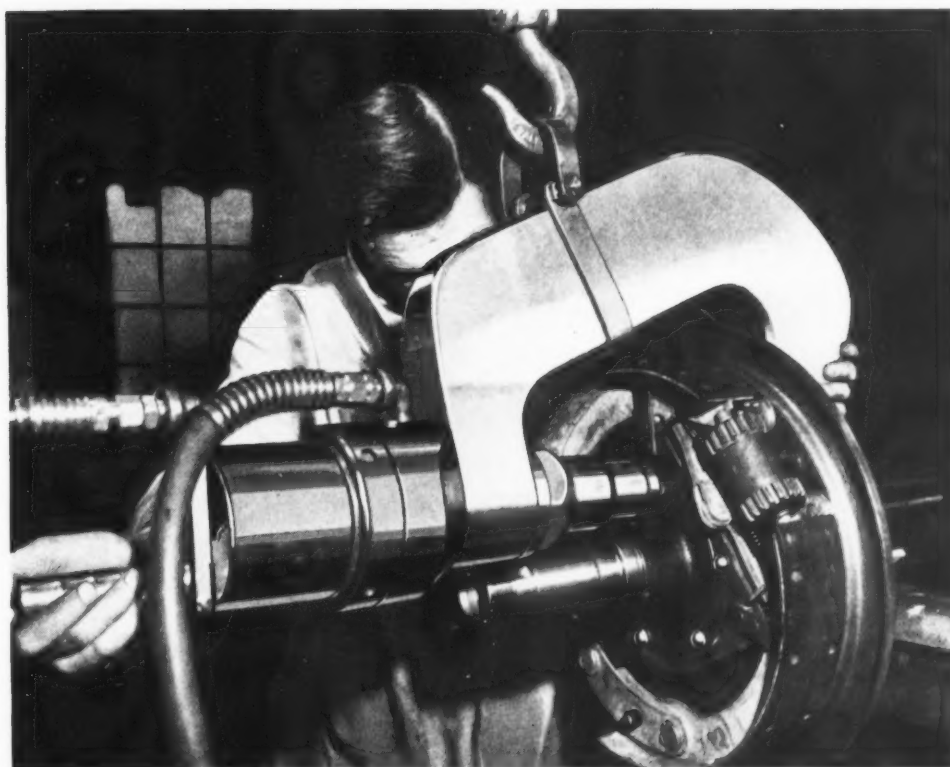
Volume 42

NEW YORK, AUGUST, 1936

Number 12

What! —

Riveting a Silent Operation?



The Most Deafening Operation in the Shop Has Now been Transformed into a Silent One by the Use of Recently Developed Hydraulic Equipment

By CHARLES O. HERB

RIVETING has always been an ear-splitting, deafening operation—the noisiest in the shop. And, it has never been easy work to hold a jerking riveting hammer steady on a rivet until it is headed. But these disadvantages have now been entirely eliminated by the use of “Hy-Power” hydraulic equipment recently developed by the Hannifin Mfg. Co., Chicago, Ill.

With the hydraulic method, rivet heads are formed quietly by a single powerful stroke of the heading tool. Rivets can be headed either hot or cold, and at unusually fast rates of production. In heading 3/8-inch rivets cold, for example, the complete operating cycle of the equipment takes only 2 1/2 seconds. In one industrial plant where rivets are driven in line, 1000 rivets are headed an hour. The heading illustration shows a riveting operation on an automobile rear axle assembly.

Hydraulic riveting equipment has already been built in capacities of from 7 1/2 to 50 tons. The smallest size is suitable for heading 1/4-inch aluminum alloy rivets cold, and the largest size, 7/8-inch rivets hot or 5/8-inch rivets cold. Each equipment consists of a riveting yoke or machine and a hydraulic pressure generating unit. The latter delivers a primary pressure of 1000 pounds per square inch to the riveting unit in each operation until the heading tool touches the end of the rivet to be headed and preforms it to the extent possible with this pressure. Then the pressure is automatically increased to 5000 pounds per square inch for heading. When the heading operation has been completed, the lower pressure is again automatically applied to return the ram to the starting position. Upon the completion of the return stroke, the pressure generator automatically shifts to neutral and idles at zero pressure.

The increase in pressure is obtained through a simple intensifying arrangement in the pressure generating unit. At the beginning of each operating cycle, oil at the primary pressure of 1000 pounds per square inch flows directly to the riveter cylinder, this portion of the cycle being known as the "prefill." After the actual heading is started, a pressure of 5000 pounds per square inch is exerted on the oil in the prefill by applying the pressure of 1000 pounds on a surface of the piston in the intensifier cylinder that has five times the area of the end that provides the pressure on the prefill oil.

The high riveting pressure permits the use of small light-weight cylinders, even when a high total pressure is required. For instance, the riveting

yoke of a 17 1/2-ton equipment (capable of heading 3/8-inch rivets cold) weighs only 54 pounds. Another advantage of the high pressure used in hydraulic riveting is that the holes in the plates being riveted are completely filled with the body of the rivets. In fact, on work that has been sawed through the center of rivets formed by this method, it is impossible to see where the rivet body ends and the steel sheets begin.

A pressure generating unit is required for each riveting yoke or machine. This unit is self-contained and is portable, so that it can be conveniently used in various locations in an industrial plant. Pressure is delivered from the generating unit to the riveting equipment through a reinforced Hy-Pressure flexible hose.

Riveting Operations are Simply Controlled

Each riveting operation is controlled by a push-button on the riveting yoke or machine, which the operator depresses to start the operation and holds depressed until the rivet has been headed. At the end of the cycle, the pressure is automatically relieved, and the push-button must be released before the operation can be repeated. If the riveting tool does not descend in line with the rivet to be headed, because the rivet happened to be incorrectly placed or the riveting yoke wrongly positioned, the operator can instantly reverse the heading tool by merely releasing the push-button.

Each pressure generating unit consists simply of a hydraulic pump that develops a pressure of 1000 pounds per square inch, a valve mechanism, a pressure intensifier, and an electric motor. The

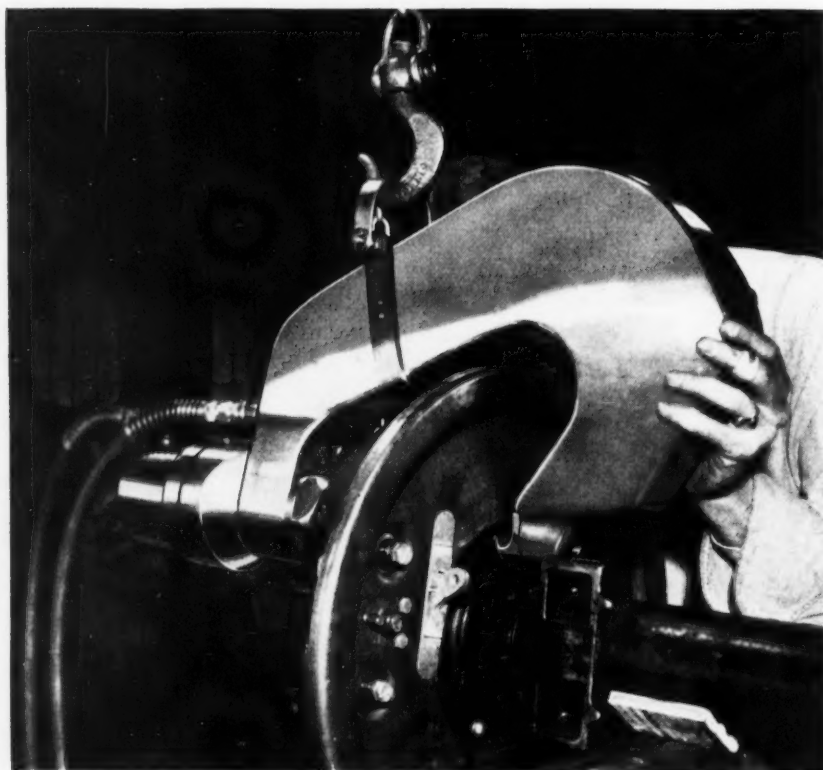


Fig. 1. Hydraulic Pressure of 5000 Pounds per Square Inch Squeezes Heads on 1/2 - inch Cold Rivets Noiselessly, at the Rate of Three Seconds Each, in Assembling Automobile Rear Axle Units



motor-driven pump runs continually, delivering oil at zero pressure, except during the operating cycle. A motor of 2 horsepower is provided on a 17 1/2-ton unit, one of 3 horsepower on a 35-ton unit, and one of 5 horsepower on a 50-ton unit.

Hydraulic Riveting Applications in Automotive Plants

The heading illustration and Fig. 1 show a hydraulic riveting operation performed to attach the backing plate and braking mechanism to an automobile rear axle assembly. When these units reach the riveting operation, the backing plate has been temporarily attached to the remainder of the unit by means of two bolts and nuts. The rivets to be driven are entered into the holes from the side of the unit shown in Fig. 1. After the rivets have been driven in the four open holes, the bolts are removed and the operation is completed by driving rivets in the holes that were occupied by the bolts.

Rivets 1/2 inch in diameter are driven in three seconds apiece in this operation. Each rivet is backed up at the rear end, as shown in Fig. 1, by an anvil attached to the riveter yoke, which is shaped to suit the limited space. Portability of the riveter yoke is especially advantageous in this operation, as the work cannot be revolved with the riveter yoke in the operating position, due to inter-

Fig. 2. Hydraulic Riveter Yokes are Conveniently Applied in Fabricating Airplanes, Streamline Trains, Automobile Frames, Electric Refrigerators, and a Variety of Other Work

fering lugs on the brake-drum. However, by suspending the yoke on a balancer, it can be conveniently lifted after each rivet is headed. Then the work can be rotated to bring the next rivet beneath the riveter yoke, and the yoke can again be lowered into the riveting position. This riveter yoke has a capacity of 35 tons and weighs about 175 pounds. The stroke of the riveting ram is 3 1/2 inches.

A riveter yoke that has proved especially satisfactory for operations on automobile frames and other structural work is illustrated in Fig. 2. Rivets of 3/8 inch diameter are being headed in the operation shown. This yoke is rated at 17 1/2 tons capacity, and weighs only 54 pounds. The riveter yokes are made of heat-treated steel forgings for minimum weight.

Fig. 4 shows another yoke type riveter designed especially for use in operations on channel sections. This riveter is of 10 tons capacity. The arm at the front which holds the backing up plug can be interchanged with others to suit the particular work to be done.

The riveting machine and pressure generating unit shown in Fig. 5 were designed for riveting rear axle tubes to the differential housing. This equipment is controlled by a foot switch, which is

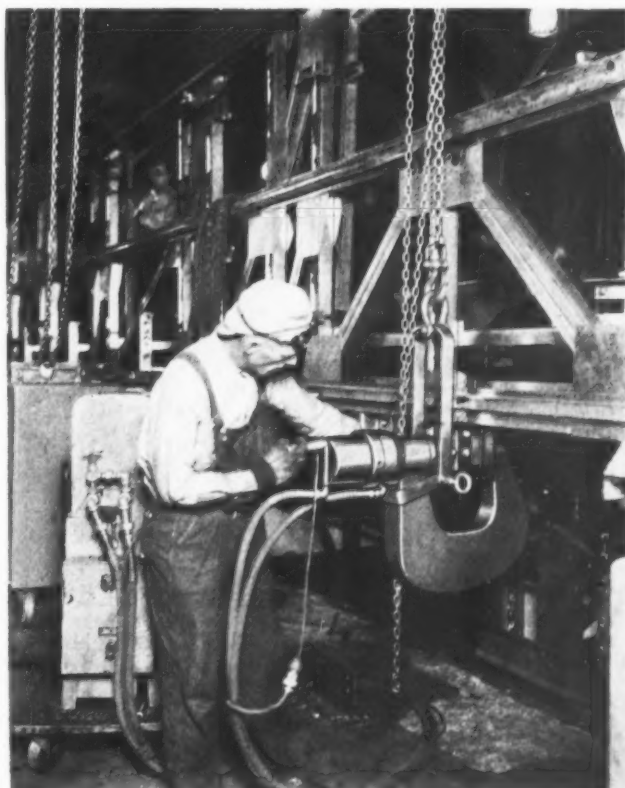


Fig. 3. Driving Rivets Hydraulically with a 50-ton Riveter in the Construction of a Streamline Train

not shown. Sixteen rivets are driven in each complete assembly. The differential housing is first slipped on an arbor and then the axle tube to be riveted is slipped into the housing. When one tube has been assembled, the unit is turned end for end for riveting the second tube.

Applications Outside the Automobile Field

The 50-ton hydraulic unit seen in Fig. 3 is being used in constructing truck underframes for streamline trains. Although this riveting unit weighs 340 pounds, the method of suspension employed permits it to be easily manipulated for riveting in any position—upside down, sidewise, or up-permost. Rivets $7/8$ inch in diameter are driven hot and $5/8$ -inch rivets cold with this equipment.

Another 50-ton unit is being used in a St. Louis plant for riveting operations in making sub-assemblies of structural members for bridges, buildings, etc. Hydraulic riveting equipment is also being used in the manufacture of electrical refrigerators, hospital beds, tractor wheels, airplanes, truck bodies, buses, and a considerable variety of other work. Equipment has been supplied not only to manufacturers in the United States, but also to concerns in Switzerland, Italy, Egypt, India, Japan and Australia, so that hydraulic riveting is now being applied all around the world.

Fig. 5. Riveting Machine and Hydraulic Pressure Generating Unit Employed in

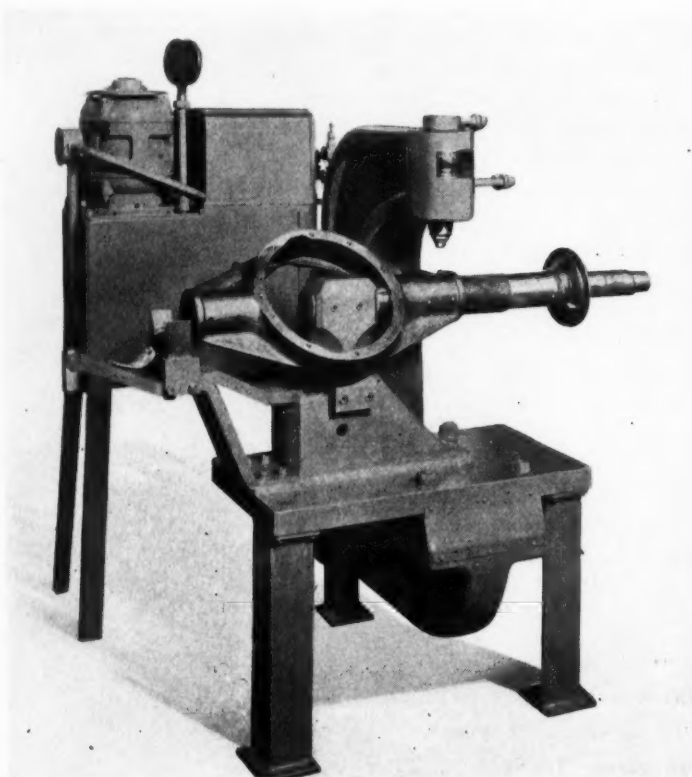
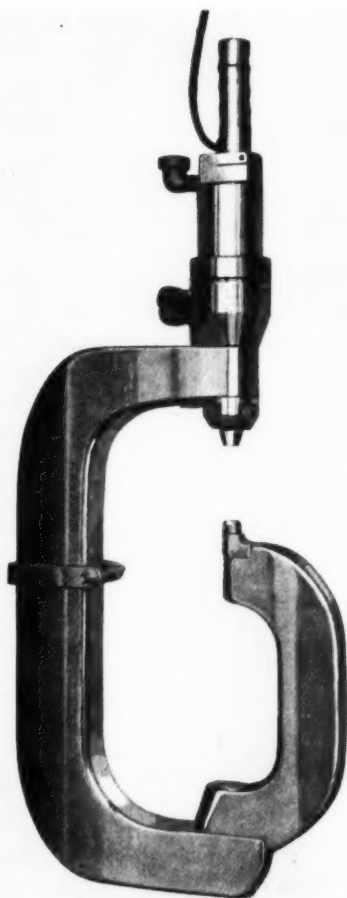


Fig. 4. Hydraulic Riveter Yoke Designed Especially for Use on Structural Channels



How Child Labor has been Eliminated in Industry

According to statistics made public by Herman H. Lind, general manager of the National Machine Tool Builders' Association, the percentage of children under fifteen years of age gainfully employed in manufacturing and mechanical industries in 1870 amounted to 10.7 per cent. This percentage was reduced to 2.9 per cent by 1930, previous to the further reduction by recent legislation.

At the same time the employment of adult labor in mechanized industries has greatly increased. In 1870 only about 6.8 per cent of the adult population was engaged in manufacturing and mechanical industries. In 1930 this percentage had risen to 11.5 per cent, another indication that the increased use of machinery has not decreased the call for labor in the manufacturing industries, but on the other hand has very materially increased it.

In this connection it might be mentioned that while recent legislation has practically abolished child labor in manufacturing industries, it has done nothing to prevent child labor in farm and agricultural pursuits; and as a matter of fact the most arduous child labor is today to be found in some of the farming and agricultural sections. Several authorities on child labor legislation have called attention to this fact, and political considerations only are believed to be responsible for neglecting farm child labor.

Riveting the Parts Together that Make up an Automobile Rear Axle Housing

What Do We Gain by Using Ground-Thread Taps?

EVERYWHERE today the manufacturer is requesting a closer tolerance on tapped holes. This accounts for the wide use of ground-thread taps. Even on ordinary commercial work, many insist on precision fits such as Class 3 and Class 4. Such fits on tapped holes can only be obtained by the use of ground-thread taps.

In a cut-thread tap, due to limitations in the manufacturing process and to the heat-treatment, distortion and warpage are likely to take place. The inaccuracies, while not so noticeable when tapping at low speeds, show up prominently when tapping at high speeds. The inaccuracies of the cut-thread tap are likely to be magnified in the work and prevent uniformity in the product. The distortion due to heat-treatment increases the friction in tapping. The shank seldom runs true with the threaded portion of the tap and lead errors are unavoidable. Hence, ground-thread taps are recommended for all but the simplest classes of work.

In the ground-thread tap, there is no distortion to contend with. The lead error is under absolute control, as well as the pitch diameter, the root diameter, and the angle of the thread. The threaded part and the shank are in alignment, since the tap is ground on centers. On the average cut tap thread, manufacturers allow a lead error of plus or minus 0.003 inch per inch, while on ground taps the lead error is commonly only plus or minus 0.0005 inch per inch.

Of course, high-speed steel ground-thread taps cost more than cut-thread taps, but the cost per tapped hole is generally much less when a ground-thread tap is used; and, after all, it is the cost per tapped hole that counts. When tapping at high speeds, a ground-thread tap will usually produce six times as many holes as a cut-thread tap; and since the cost of the tap is only a slight amount greater, the adoption of ground-thread taps for all work will mean not only an ultimate saving, but better work and less strain on the tapping machine, since the ground-thread tap requires much less power to drive.

Because there is less friction and abrasion, the ground-thread tap remains sharp longer and produces more holes between grinds. All conditions being equal, the ground-thread tap requires only about one-fifth the number of sharpenings for the

The Advantages of Ground-Thread Taps as Observed During a Long Period of Wide Experience with Tapping Problems

By H. GOLDBERG, Vice-President
R. G. Haskins Co., Chicago, Ill.

same number of tapped holes as a cut-thread tap. Again, conditions being equal, it is not so easily broken. All these advantages are in addition to its capacity for producing a more accurately tapped hole.

With the introduction of the so-called "commercial"

ground-thread tap, which costs but little more than a cut-thread tap, it is possible to maintain a Class 2 fit on all work. While this may sometimes be done with cut-thread taps, the results are not always uniform. The use of ground-thread taps will avoid many unexpected difficulties.

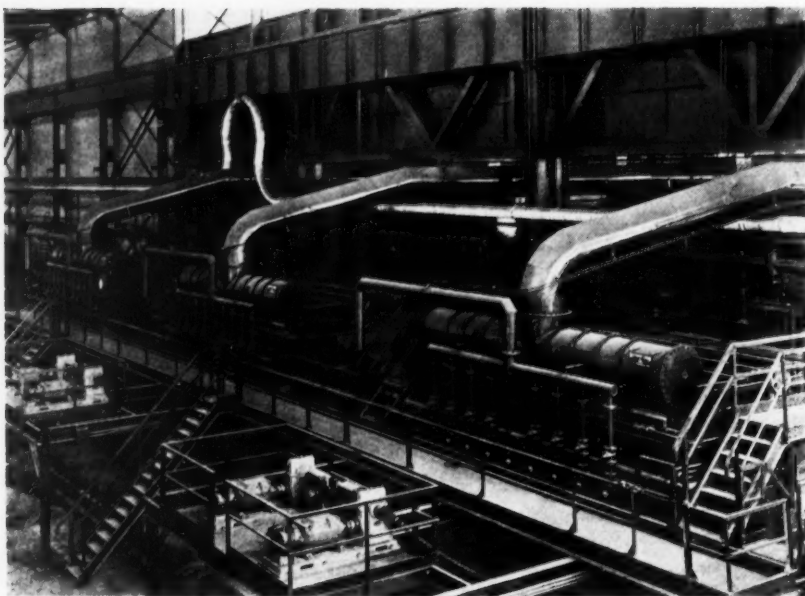
Carbon Steel and High-Speed Steel Taps Compared

In this connection, it may be of interest to mention the advantages gained by using high-speed steel taps. Opinions vary as to the merits of these taps over carbon steel taps, especially in the smaller sizes. It is generally claimed that they break too easily, are too brittle, and cannot be properly heat-treated. Hence carbon steel taps are preferred. While it is true that until recently there was no high-speed tapping equipment that would take full advantage of the possibilities of high-speed steel taps, modern equipment has the rigidity and accuracy that will make high-speed steel taps the most economical to use on production work, even in the smaller sizes. This is especially true when ground-thread taps are used.

* * *

If the present-day efforts to make the rich poorer in order to make the poor richer had any likelihood of success, there would be something to commend them; but as a matter of fact, no scheme yet proposed for making the rich poorer has shown the slightest promise of making the poor more prosperous. In the last six years, certainly the rich have become poorer, but one fails to see any evidence that this has resulted in making the less fortunate any better off. Perhaps we are on the wrong track. Perhaps it is not the rich as such, but rather special privileges—which is a very different thing—that ought to be taxed for the benefit of the community.

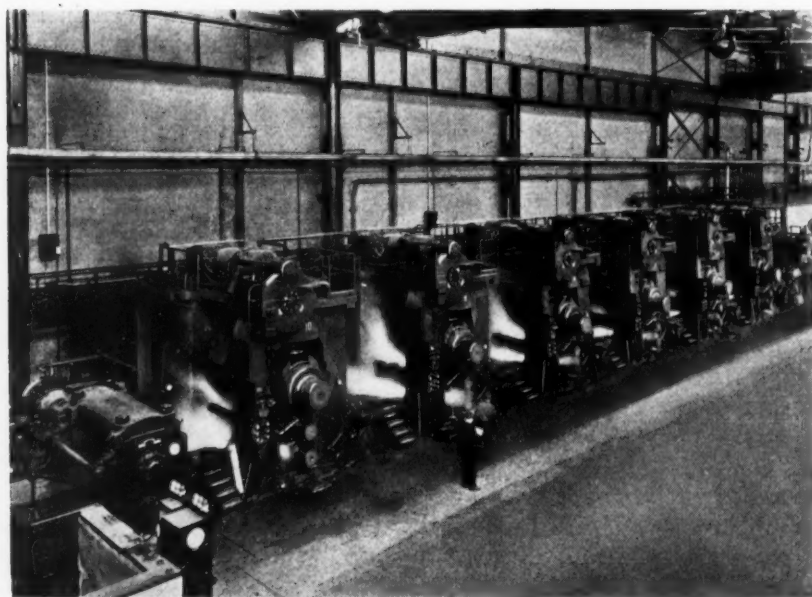
From White Hot Slab to a Strip



In the Bethlehem New Continuous Sheet Mill at Lackawanna, N. Y., Heated Slabs of Steel are Transformed in Two Minutes into Piles of Sheets or Coils of

Furnaces in which 165 Tons of Slabs can be Heated an Hour Preparatory to Rolling in the Hot Mill of the Bethlehem Steel Co.'s New Continuous Strip-sheet Mill at Lackawanna, N. Y.

The Finishing Train of Rolls from which the Steel Emerges in Light Gage Strip Form, Traveling up to 1350 Feet a Minute. A Steel Sheet 6 Feet Wide can be Produced in this Mill



THE demand for steel sheets and strip has recently increased so rapidly that today these two products of the steel industry account for over 30 per cent of the total finished steel output. The volume of these products, amounting to less than 1,400,000 tons in 1911, reached a record height of nearly 8,000,000 tons in 1935.

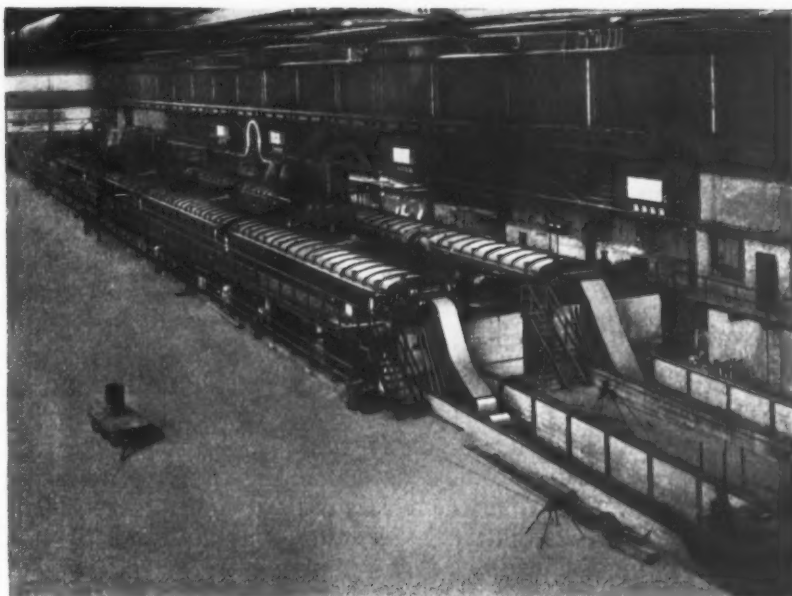
The automobile has, of course, been responsible for a large part of this increase, but in addition, steel strip and sheets find increasing use in the fabrication of ducts, containers, roofing, furniture, and thousands of formed and stamped products. Their increasing application in many forms leads one to believe that flat rolled products are destined to become even more extensively used.

The method of rolling both hot- and cold-rolled sheets by the continuous process has made it possible to produce economically sheets of better quality and greater accuracy—a factor that obviously tends to open up new markets for this product.

To meet this growing demand, the Bethlehem Steel Co. has built, at the cost of over \$20,000,000, a new continuous strip-sheet and plate mill at Lackawanna, N. Y. This mill covers twenty-two acres of floor space and has an annual capacity of 600,000 tons of strip, sheet, and light plate. It is one of the few continuous mills capable of producing strips and sheets of extreme widths. For example, strip

of Sheet Steel in Two Minutes

Strip Steel 6 Feet Wide
—the Metal during this
Time Traveling 1350
Feet through Successive
Pairs of Rolls, or More
than Six City Blocks
in a Straight Line



up to 60 inches in width by 0.0625 inch in thickness, and 72 inches in width by 0.078 inch in thickness, can be hot-rolled continuously in one heating in the new hot mill.

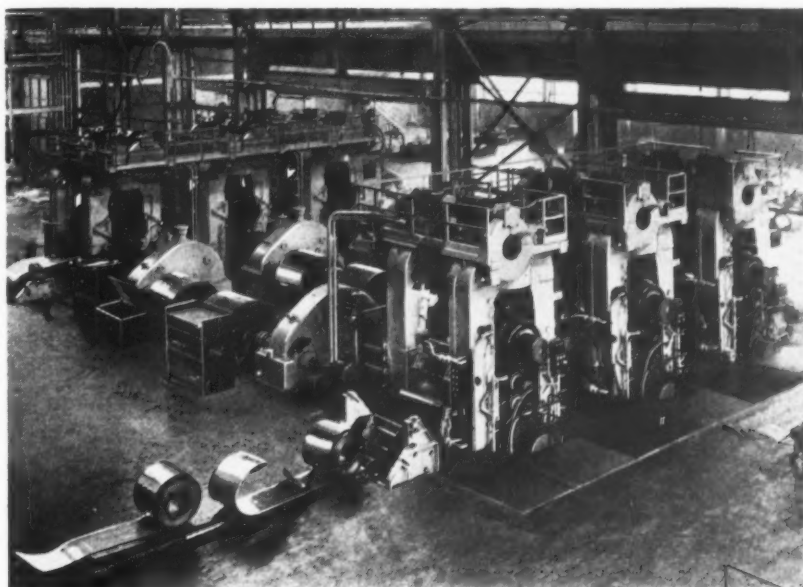
Cold-rolled strip is produced in ranges of from 18 1/2 to 72 inches wide, and from a thickness of 0.0125 inch for the narrow widths up to 0.109 inch for the wider strip. By "cross-rolling" in a 93-inch, four-high mill, sheets can be rolled up to 84 inches in width.

The first rolling of steel between two cylinders of hard metal is said to have been done in England in 1778. The continuous rolling of steel, or the passing without interruption of hot metal through a series of stands set in tandem, was introduced in the United States in 1868. It was not until about ten years ago, however, that strip steel as thin as 18 gage and as wide as 36 inches was successfully rolled through the use of four-high stands, with two working rolls operating between two larger supporting rolls. Improvements have been rapidly made, and now it is feasible to roll sheets as wide as mentioned above.

In the new Bethlehem hot mill, a white-hot slab drops down from a furnace, is carried along a roller table through a train of ten stands of mills, and two minutes later is piled up in sheet form or wound up in coils 1350 feet from where it started—a distance of more than six ordinary city blocks.

Two Continuous Pickling Lines at the New Mill. As Each Coil is Pulled through the Pickler, a New Coil is Attached to the End of it, thus Making the Process Continuous throughout

Two Groups of Three Tandem Cold-rolling Mills in the New Strip-sheet Plant, in which Coils of Strip are Cold-rolled. One Set of Mills Rolls up to 4 1/2 Feet Wide; the Other, up to 6 Feet



As the heated slab starts on its journey down the roller table, it moves haltingly at first in passing through the train of roughing mills, but gathers momentum as it lengthens while being reduced in thickness, and leaves the last roughing mill at a speed of 410 feet a minute. The slab halts for a moment and then, as it enters the final group of finishing mills, it goes forward with constantly increasing speed until it leaves the last finishing mill stand at a speed of over 1300 feet a minute. Still at red heat, the strip moves down a roller table 750 feet long, becoming darker as it cools, until it reaches an automatic coiler or piler—the latter if it has been cut into sheets by the synchronized flying shear located at a point where the strip leaves the finishing mills.

Thus, with the movement never entirely stopped, and progressing steadily along a continuous straight line, hot sheet and strip steel is manufactured today in this new plant in a couple of minutes. Up to a few years ago, to produce as much hot-rolled product, many men would have labored for hours passing sheets back and forth for numerous rollings, and taking them to and from the furnaces for heating and reheating.

While speed is the keynote, quality and precision are obtained to a degree entirely impossible in former days, when the job was done mainly by manual labor. With the old method, imperfections due to frequent handling and to mistakes in judgment during the process were unavoidable. Today, the control of the temperature of the steel is much easier, since the great speed of the continuous process eliminates the need for frequent reheatings. This accurate temperature control assures proper granular quality of the metal passing through the mills.

The Cold-Rolling of Sheets in the New Mill

The most important function of cold-rolling is to reduce the sheets to a lighter gage than can be economically hot-rolled. Furthermore, for many uses, strip and sheet steel must be refined beyond the stages provided for in the hot mill. For example, many sheets require thorough pickling to remove all impurities from the surface of the metal. Further, to obtain the highest grade of ductility, so as to permit deep drawing of sheets in manufacturing processes, and to improve the grain structure of sheet metal after the hot-rolling process, careful heat-treatment in box annealing furnaces is required. After these treatments, the sheet must be rolled in the "skin-pass" mills and undergo a slight reduction to give them a finely polished surface. These cold-rolling and auxiliary operations are carried out with the same continuous flow of material as in the hot mills.

Cold-rolled strip has a more accurate thickness and a more definite degree of hardness than can be obtained by hot-rolling, and it has a better polished, glossy surface.

The hot coils intended for cold-rolling are picked up by an overhead magnet and deposited upon a coil "up-ender" which lays the coil down flat. The coil then proceeds through the pickling line, 300 feet in length, moving continuously. The strip first passes through an uncoiler and a roller leveler, and then comes to a shear which cuts the front and rear ends off evenly. As the front end of the succeeding coil is cut off, it is attached to the preceding one by a stitching machine, so that the strip moves through the pickling process in one continuous ribbon.

The metal is then rolled cold, for which process much more force must be exerted than in hot-rolling. The customary reduction is about 60 per cent in thickness, as the strip passes through a train of three mills. The sheets emerge from the last stand at a speed of 660 feet a minute.

Following the rolling comes box-annealing, which gives the sheets the ductility required for deep drawing processes. The annealing cycle requires several days. After annealing, the sheets are given a slight reduction of from 1 to 3 per cent in a "tempering" or "skin" mill. Then the strip is delivered to the process building for the final operations preparatory to shipment. For plain, flat material, the sheets are passed through a roller leveler, which flattens out all elevations and depressions and straightens any bends in the sheets that may have resulted from handling. The sheets thus leveled are flat enough for ordinary purposes, but when perfectly flat sheets are required, they are subjected to "stretcher" leveling.

Some sheets are oiled to protect them from rusting in transit, and for this work, special oiling machines are provided. Finally, the sheets and coils are crated or otherwise provided with protective coverings for shipment, loaded on railroad cars, and passed on to the thousand and one uses that industry is now finding for sheet steel.

* * *

Hacksaw-Blade Simplified Practice

The Bureau of Standards, Washington, D. C., announces that the Standing Committee in Charge of Simplified Practice Recommendation R90-29 for Hacksaw Blades, has approved a revision of the former recommendation. The Division of Simplified Practice of the Bureau of Standards has mailed copies to those interested for consideration and approval. The present recommendation became effective July 1, 1929, covering the length, width, thickness, and number of teeth per inch of hacksaw blades made from carbon and tungsten high-speed steel—hand and power sizes. The proposed revision lists the lengths, widths and thicknesses, together with the number of teeth per inch and other dimensions, of tungsten high-speed steel blades, as well as special alloy blades. Copies of the proposed revision may be obtained from the Division of Simplified Practice, National Bureau of Standards, Washington, D. C.

Precision Operations in the Manufacture of Turret Lathe Spindles

The Accuracy Required
in Machine Tool Build-
ing and the Methods
Adopted to Meet the
Requirements are Well
Exemplified in the Case
of Spindles for High-
Powered Turret Lathes

By WILLIAM J. BURGER
Works Manager, The Warner & Swasey Co., Cleveland, Ohio

IN these days when preloaded anti-friction bearings have been adopted as standard equipment in high-grade machine tools; when power input has been so greatly increased, speeds jumped up, and cutting pressure and torque stepped up on account of the heavy cuts taken; when chatter is no longer tolerated, and demands for fine finish and high accuracy grow constantly more exacting—in these days the duties of the spindles of turret lathes are indeed heavy.

Bear in mind, first, that the spindle is the main gateway through which flows the power of the machine tool. At least 75 per cent of the 60 horsepower of a large heavy-duty turret lathe enters

directly into its spindle and is absorbed in the work being done at its nose or chuck end. Second, upon the spindle falls the primary responsibility of holding the part firmly while the work is being done. Hence we have an unusual combination of high horsepower, heavy vise-like gripping action, speeds as high as 3600 revolutions per minute, smoothness of action which denotes perfect balance, and split-thousandth accuracy which reflects the perfection of the spindle, its bearings, and its mounting. To make these rather antagonistic requirements blend, much engineering thought, practical experimentation, and manufacturing experience have been devoted to the improvement of spindles during the

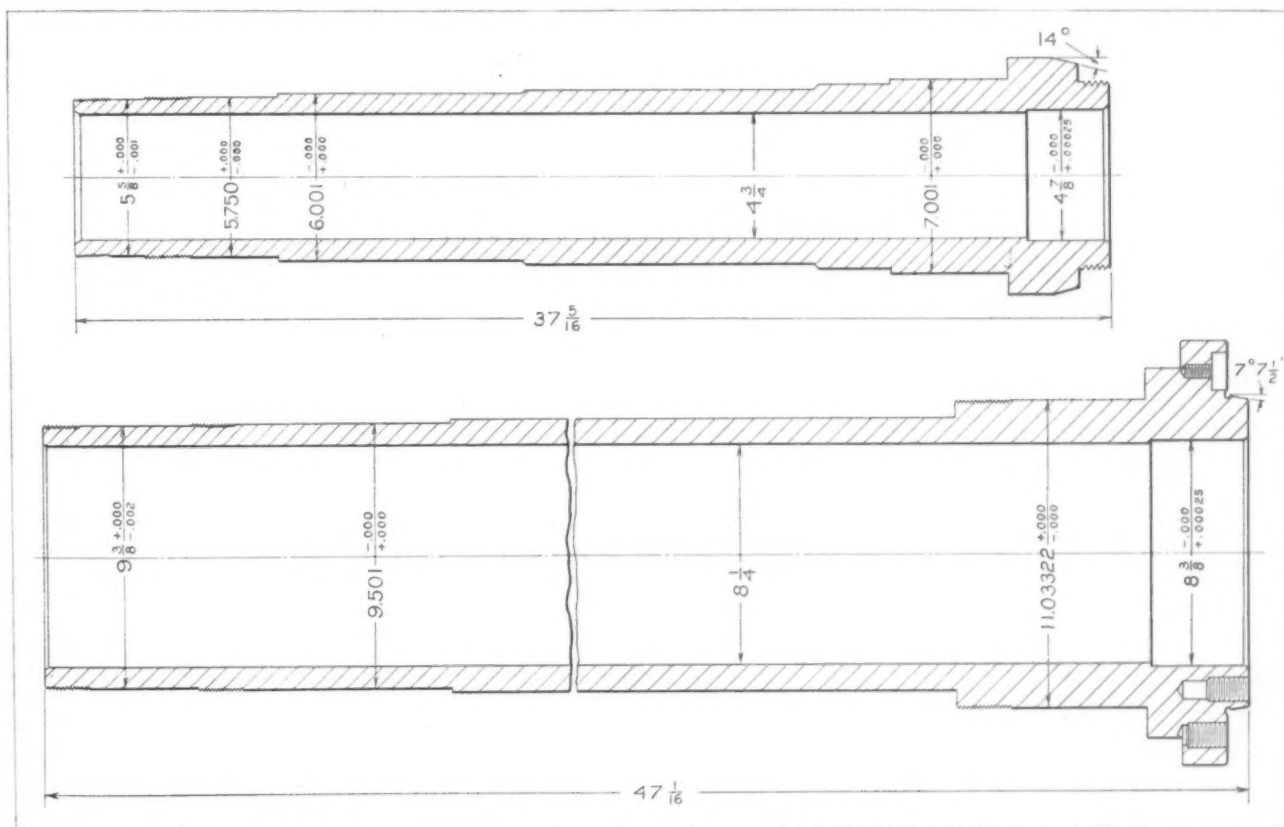


Fig. 1. General Design of Two Spindles for Turret Lathes, the Upper One Having a Threaded Nose and the Lower a Flanged Nose

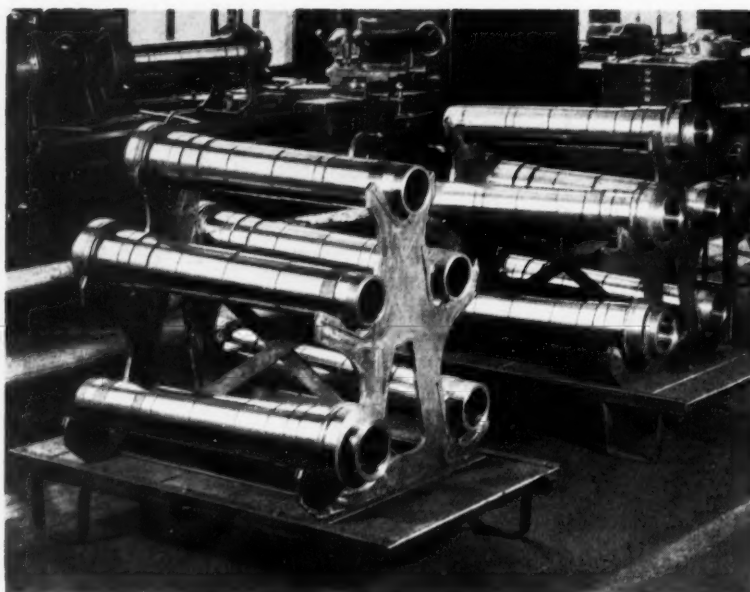


Fig. 2. Spindle Trucks or Carriers Prevent Damage to the Finished Surfaces. Note the Copper Pads Riveted to the Bracket Arms

recent period of rapid development in machine tools.

The field of turret lathes covers machines ranging from those designed for the production of small brass parts from bar stock under 1/2 inch in diameter up to those massive, heavy-duty machines that handle steel bar stock up to 12 inches in diameter and iron and steel castings up to about 30 inches in diameter. The contrast between the machines themselves is almost as great as it is between the work that they perform. The small high-speed machines may produce tiny details used in recording instruments and motion picture apparatus, and the large machines, massive parts for locomotives and ocean liners. Back of them all, however, the basic principles of spindle design are the same. In this article, two kinds of spindles will be considered—one, shown in the upper view of Fig. 1, having a threaded nose; the other, shown in the lower view of the illustration, having a flanged nose.

The first step in production is the hand-forging of solid blanks from square billets of SAE 1050 steel. While this work is done in an outside forge shop specializing in work of this kind, a close check is kept upon it by the metallurgist and the engineers of the machine tool builder. The spindles are forged from billets which are long enough to produce two spindles per billet, nose to nose. Half the billet is heated at a time, the cold half serving as the "handle" during heating and forging. Heating is done in coal-fired

muffle furnaces, and forging under steam hammers.

The spindles in Fig. 1 are rough- and finish-forged at one heat; very large spindles require a reheat before finish-forging. The billet is somewhat larger in diameter than the greatest diameter of the spindle blank, one requirement being that the metal be thoroughly worked to the center during the forging operation in order to get the maximum "compacting" and refining effect. At least 1/2 inch is allowed on all diameters and lengths for subsequent machining operations. The forging process is an excellent

example of skilled blacksmithing, in which years of experience are essential to success.

Annealing is accomplished in a simple but effective manner. The hot blanks are placed in the heating furnace as the fire is drawn, and they are allowed to cool down with the furnace over a period of several hours—usually over night. This insures blanks free from hard spots and internal strains. The blanks are end-sawed and centered at the forge shop. Experience has proved conclusively that, with the type of steel used, aging of the spindles either before or after roughing is unnecessary, there being no subsequent movement of the metal. The blanks come out from under the hammers free from heavy scale, and are surprisingly round and straight. Although the sizing is controlled by gage-blocks between the hammer and anvil, everything else depends upon skill of hand and eye—an excellent example of how even today the craftsman has his place in industry.

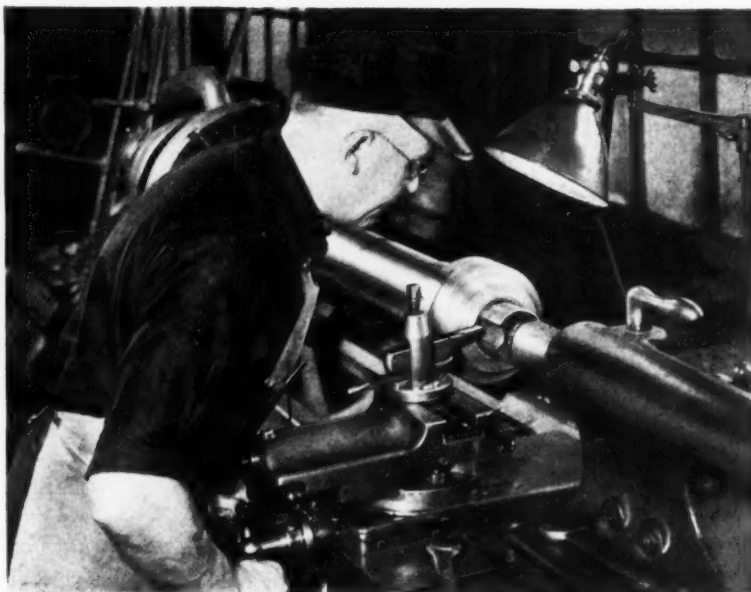


Fig. 3. Recentering a Spindle Prior to Mounting it on the Special Arbor Used in Finish-turning and Grinding. Note the Plug Center with Slot Permitting the Centering Tool to Reach the Inside of the Bore

Fig. 4. Grinding a Spindle to Exact Size. Note Use of Transfer Gages at Left which Maintain Uniformity of Size and Simplify Gaging

Rough-turning of the spindle blanks is carried out on heavy-duty engine lathes. Solid blanks are held between ordinary pointed centers, while those that have previously been rough-bored are held between special large centers having a very slight taper. Cobalt cutters of the blunt single-point type are used for roughing; they are pushed to the limit, as accuracy and finish are not called for.

The rough-turned spindles are placed on racks called "spindle trucks." These spindle trucks, Fig. 2, thereafter provide both storage and means of transportation up to the time of final assembly. The racks, cut from steel plate by the acetylene torch, have horns on which the spindles rest; these horns are covered by soft copper pads to protect the spindles from damage. The racks are mounted on standard lift-truck platforms.

The rough- and finish-boring of the spindles are done in special horizontal machines, gun drills with interchangeable high-speed steel blades being employed. Boring from the solid to within 0.020 inch of finished size is accomplished in one operation, the final 0.020 inch being removed by the finishing blade.

Finish-Turning and Grinding

Before the finish-turning and grinding, the bored spindles must be carefully recentered. This is done on special arbor type centers, the tailstock center being slotted, so that a centering cut can be taken from the compound rest of the lathe at the required



30-degree angle by means of a cutter mounted in the toolpost. This operation, Fig. 3, must be very carefully done, the exact depth of the centers being specified on the drawings.

Following the recentering operation, the spindle is mounted on a special finishing arbor for the finish-turning and grinding operations. The finishing arbor, which is accurately centered to run on regular lathe and grinder centers, consists of a long rod with a tapered drum integral with one end and a similar tapered drum screwed on the other end. The recentered spindle rides on these two tapered drums, being tightly clamped between them and secured with a lock-nut behind the removable screwed-on drum.

Nothing is left to the imagination of the machinist. Complete dimensions are given on the drawings, even to the depth of centers, depth and width of "necks" for grinding, and exact lengths of all threads, keyways, etc. Both turning and grinding dimensions are given with limits in each case. The usual limits for finish-turning are $+0.020$ to $+0.025$ inch, but on the seats for the roller bearings the grinding limits are $+0.000$ and -0.000 inch. In other words, the specified dimensions must be held exactly. Accompanying each drawing is a complete operation sheet.

While the making of these spindles may appear at first glance to be engine lathe, grinder, milling machine, and drilling machine practice of the familiar tool-



Fig. 5. Gaging the Taper Nose of a Turret Lathe Spindle. The Dimension of the Master at the Right is Transferred to the Work. The Master is Also Designed for Use in Gaging the Taper Bore in Chucks

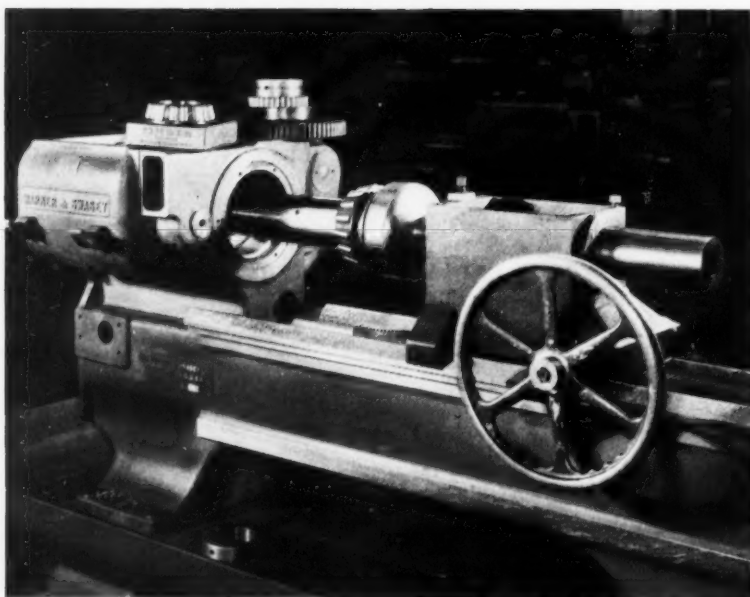


Fig. 6. Assembly Fixture Used for Setting the Finished Spindle into the Headstock

room variety, it actually is real manufacturing, due to the carefully worked-out sequence and nature of operations, and also to the high degree of skill acquired by the men who specialize on this work. While some special equipment is employed (for instance, centering arbors, finishing arbors, and transfer gages), the work, in the main, depends upon single-point tools and micrometers. It might be called "manufacturing by the scheduled skill method."

Operations in Finishing the Spindle Nose

Of the various operations not already described, those involved in the finishing of the nose are of interest. These operations follow grinding, as the spindles are run in steadyrests on the finished seats of the front bearing, in order to insure concentricity. The spindle is gripped and driven by a three-jaw chuck clamped upon a protective ring screwed on the threaded rear end. A very careful job of centering the work in the chuck has to be done, this being carried out with the help of a dial indicator. At this set-up (in the case of the threaded-nose spindle), the nose is accurately threaded; "oil-slinging" grooves are formed in the periphery of the collar (which already has been ground); the nose is rebored to limits of -0.000 and $+0.00025$ inch to a depth of 3 inches; the nose surfaces are accurately faced; and finally, the 14-degree taper is cut on the front end of the collar—this being carefully checked by means of a taper ring gage.

In the case of the flanged-nose spindle, the operations performed at this set-up are: Finish-turning and facing of entire nose end; necking at base of front face of collar; turning a 7-degree $7\frac{1}{2}$ -minute taper on the nose; and reboring the nose end to $8\frac{3}{8}$ inches (-0.000 and $+0.00025$ inch) to a depth of $3\frac{1}{2}$ inches. Following this, the thread is cut on the 11-inch diameter at the rear of the front bearing seat, and the "oil-slinging"

grooves are formed on the shoulder behind the spindle nose collar. All of these are single-point tool engine lathe operations.

On the flanged-nose spindle it is vital that the nose taper not only be extremely accurate as to its angle, but also that it be in precise relationship to the face of the collar. The faceplate or chuck plate must draw down tight on the taper, and at the same time, its face must seat evenly against the face of the collar. At this point, a very accurate master tapered ring and face gage is used, together with a special transfer gage. The latter is a micrometer with its barrel mounted in

the frame, so that the face of the caliper is at 7 degrees $7\frac{1}{2}$ minutes. The front faces of this micrometer frame are gaging surfaces which bear against the face of the collar, and by this combination of gaging surfaces, the proper set-back of the face of the collar from the taper is accurately transferred from master gage to work. The use of these special flanged-nose gages is shown in Fig. 5.

To continue on the subject of the large spindle, it should be noted that the face of its collar is pierced by two concentric rings of accurately spaced holes. These holes are drilled, counterbored, and tapped while the spindle is held in an upright position on the table of a radial drilling machine. The drilling is done through a jig plate, which is held down on the work by a rod passing through the spindle into the bed of the drilling machine. This rod also serves to hold the spindle firmly in its upright position.

Mention has already been made of the fact that no variation is allowed on the ground diameters of the bearing seats. Sets of transfer gages are used in connection with these grinding operations. The set shown in Fig. 4 consists of a series of hardened and ground disks mounted on a stand, each disk being the exact diameter of one of the ground diameters on the spindle. The grinder operator simply sets his micrometer carefully to the disk corresponding to the diameter on which he is working and continues to grind until the diameter of the disk and that of the spindle surface correspond exactly.

Woodruff keyways are cut in a horizontal milling machine, while straight keyways are cut in a vertical miller. On the smaller spindles, double keys are used, which must be located exactly opposite each other. To accomplish this, the spindle is mounted in V-blocks and an index ring is clamped on the nose end. By means of this ring, indexing exactly to 180 degrees is accomplished.

An Ingenious Inspection Fixture

While it is not within the scope of this article to cover the subject of assembly, a few words regarding the ingenious fixture used in setting the spindles into the headstocks may not be out of place. This fixture, shown in use in Fig. 6, consists of a trumpet-shaped tube mounted longitudinally in a box-shaped carriage which slides along the ways of the turret lathe bed. This carriage is moved through a large handwheel on the front of the carriage. The handwheel is mounted on a shaft carrying a pinion which meshes with a rack on the bed between the ways.

The finished spindle, delivered to the main assembly floor on a spindle truck, is loaded into the fixture—being held by the nose in the bell of the trumpet-shaped tube. The fixture is then moved toward the headstock, the spindle advancing into the hole, as indicated in Fig. 6. As this movement progresses, the bearings, gears, nuts, and other supplementary details are pressed or screwed on in

their proper order. This assembly fixture can perhaps best be described as a form of horizontal arbor press. It does away with all secondary lifting and handling of the spindle, gives the straight-line pressure required during assembly, assures exact alignment, and protects the spindle against the damage incident to ordinary handling.

The care with which the spindles themselves—as well as the parts which fit them and into which they fit—are made does away with the traditional "fitting at assembly." Examples like this serve to explain why experience counts in the machine tool industry far more than in most of the other metal-working industries. It further explains why the machine tool industry experiences difficulty in finding the right kind of workmen in sufficient numbers to staff its plants properly in boom times—especially after a long depression. It may not be difficult to find men to build just machines—even such fine ones as automobiles—but when it comes to employing men to build the machines that build machines, that is quite another thing.

Cleveland Twist Drill Company Celebrates Sixtieth Anniversary

ON June 27 the Cleveland Twist Drill Co., Cleveland, Ohio, celebrated its sixtieth anniversary. The business was organized in 1876 by J. D. Cox and C. C. Newton as a partnership. At first they had only one lathe and one milling machine and employed one man besides themselves; but the business grew rapidly, and in 1879, the partners occupied a three-story building and were manufacturing milling machines and planers, in addition to twist drills and reamers.

In 1880 Mr. Newton sold his interest in the business to F. F. Prentiss, who is now chairman of the board of directors. Mr. Cox continued to run the factory and design the machinery, while Mr. Prentiss attended to sales.

The company has pioneered, during its sixty years of existence, much research in the field in which it is engaged. Recent efforts in that direction resulted, in 1933, in a patent on a new type of high-speed tool steel, the base of which is molybdenum rather than tungsten. This steel is now meeting with widespread acceptance.

The company has been noted for its progressive policy in employe relations and in the improvement of working conditions. It was one of the first companies in Cleveland to install modern sanitary arrangements for its employes. It established a reading room and pioneered night classes until the Y. M. C. A. and other organizations undertook similar work. It also opened a restaurant, where everyone in the employ of the company can obtain a lunch at cost or less.

In 1915, the company inaugurated a profit-sharing plan, whereby every employe shares in the annual profits in proportion to his annual salary or wage. The company has also established profit-sharing notes, enabling any employe to deposit with the company money up to the limit of his annual salary or wage, upon which he is guaranteed a rate of 6 per cent interest, and if the profits justify it, he will earn an extra dividend. From 1919 to 1935 these notes have returned to employes who invested in them an average of more than 12 per cent a year. Since 1915, the company has paid out in dividends and interest on participation notes and in the profit-sharing plan more than \$2,100,000. The large number of people who have been in the company's employ for a great many years testifies to the success of the company's efforts in establishing friendly employe relations.

* * *

The plant of a well-known steel company, according to *Oxy-Acetylene Tips*, hard-faces all guides in the rail mill. Some of the guides are quite large and require from 4 to 5 pounds of wear-resisting material. It is stated that, in many cases, guides hard-faced with Stellite have lasted fifty times as long as those made from other guide materials tested in the mill. After being hard-faced, the guides are accurately ground in the machine shop. The extra expense of a carefully done job is warranted by the long life obtained.

Typical Applications of Roller

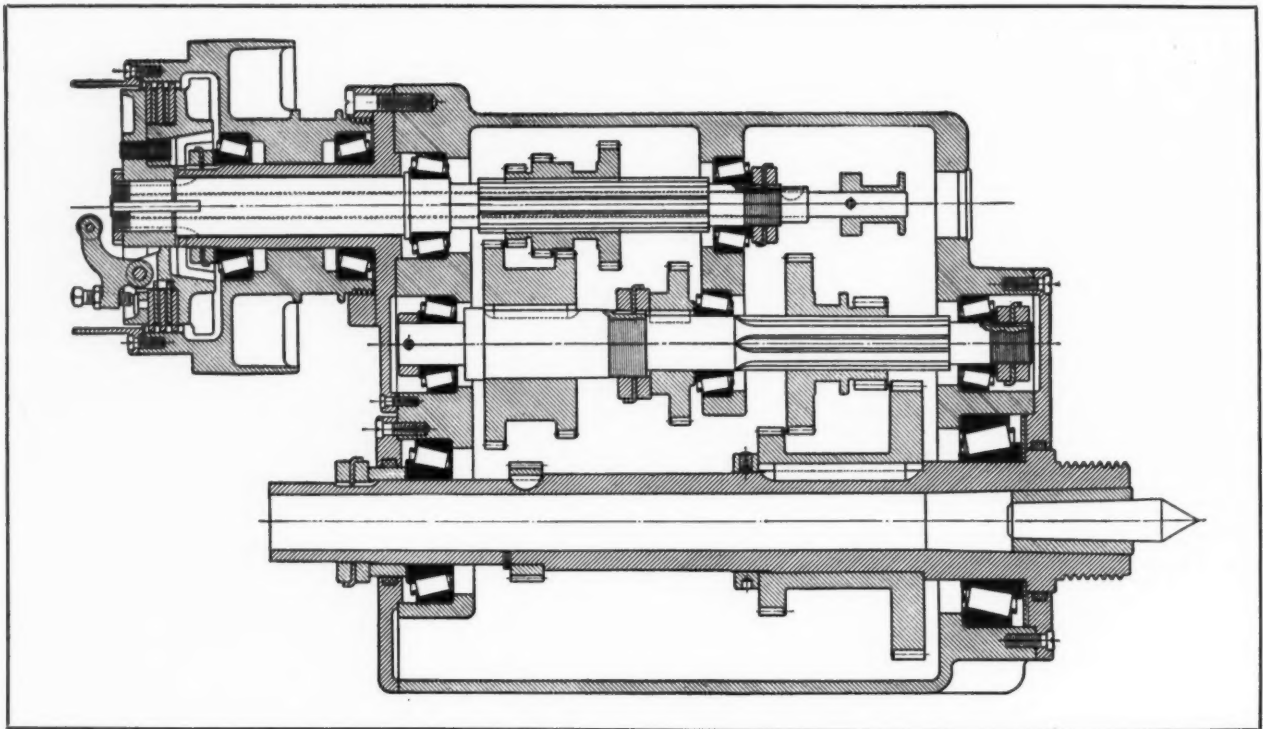


Fig. 1. Lathe Headstock Illustrating what is Known as the Indirect Type of Roller-bearing Mounting

DURING recent years more and more exacting demands have been made on all types of machine tools. To meet these demands, designers have called for greater accuracy in the bearings, as well as increased rigidity and adaptability. Bearing manufacturers have cooperated with machine tool designers in their efforts to increase the precision and the life of machine tools by improving both the load-carrying characteristics of the bearings and their precision. Tapered roller bearings have been steadily improved by the introduction of the latest type of manufacturing equipment, by the development of specially designed roll-sorting machines, and by improvements in the design of the bearing itself. The introduction of special

machinery for selecting rollers to a tolerance of 0.0001 inch or less on "out of roundness," "off taper," and size, and the development of new heat-treating practices have made possible the production of bearings with a maximum run-out of from 0.0003 to 0.00015 inch, or even less.

Two Applications to Geared Lathe Headstocks

The geared lathe headstock, for example, lends itself well to the application of Timken tapered roller bearings of the precision type. Thrust loads and shocks resulting from sliding gears and clutches are easily handled by this type of bearing, which carries radial, thrust, or combination loads without

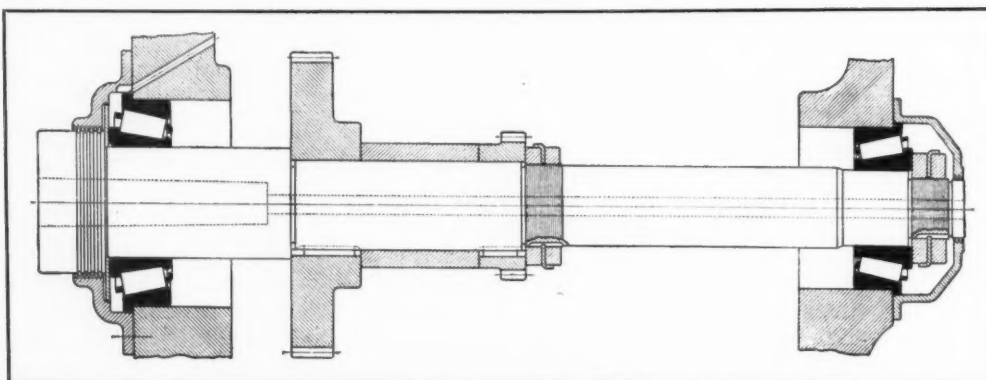


Fig. 2. Mounting for Milling Machine Spindle with Flanged Type Bearings

Bearings to Machine Tools

By S. M. WECKSTEIN
Assistant Chief Engineer
Timken Roller Bearing Co.
Canton, Ohio

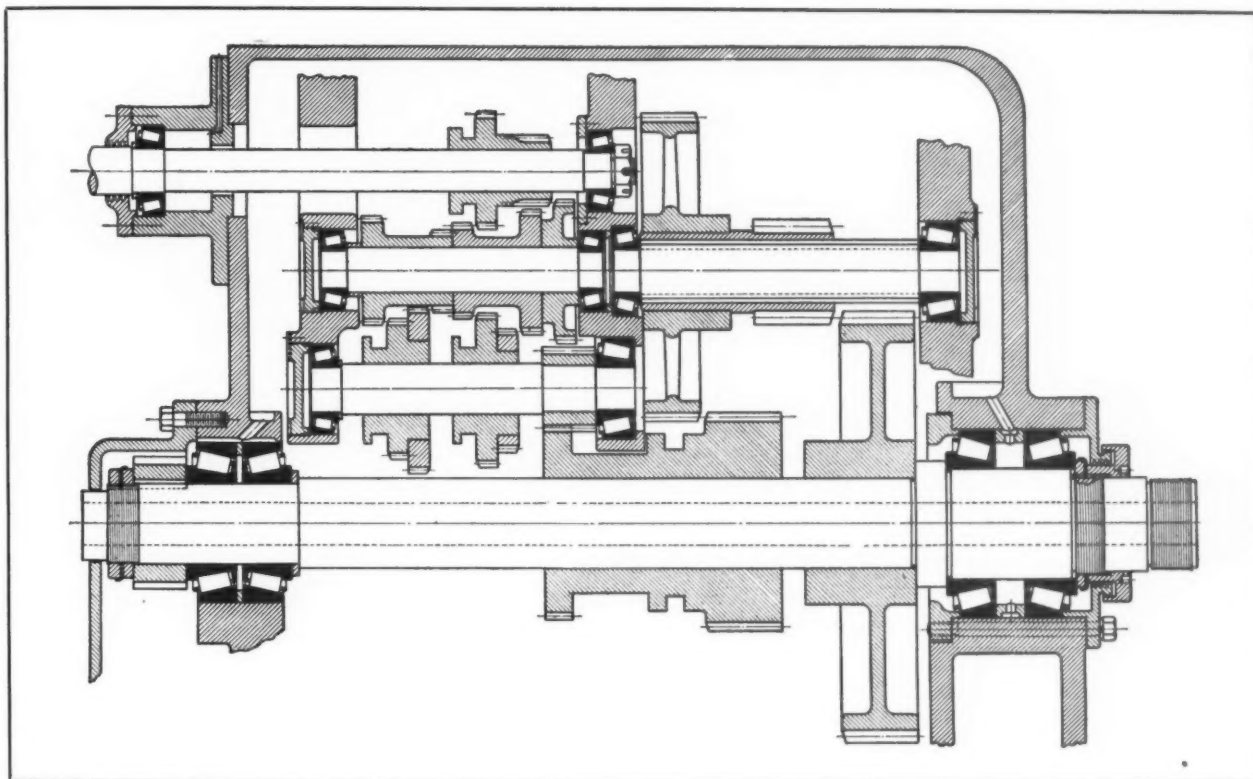


Fig. 3. Lathe Spindle Mounted in Two Roller Bearings at Each End

difficulty. Figs. 1 and 3 illustrate two typical methods of gear-shaft and spindle mountings of compact and rigid design.

In Fig. 1, the "indirect" type of mounting is shown. Here the cups are pressed into the case, and the cones given a tapping tight fit on the shaft. The clutch pulley is mounted in two bearings which are independently set up by means of the nut shown. The first and second gear shafts are similarly mounted. Two bearings are used on the main spindle. This mounting is such that all thrust loads from the tools are taken directly by the front bearing and transmitted to the head.

The rigidity of this type of spindle was tested by mounting a piece of steel 18 inches long and 6 inches in diameter in the chuck. The specimen was first turned and then bored to exceptional limits of accuracy. Rings were then cut from the end of the piece, without the use of an outside center support or steadyrest. On testing these rings on a surface plate, they were found to be true. A corresponding test on a machine with plain bearings showed considerable chatter.

Fig. 3 shows a lathe headstock in which the spindle has two Timken bearings on each end. The bearings at the nose end locate the spindle in the

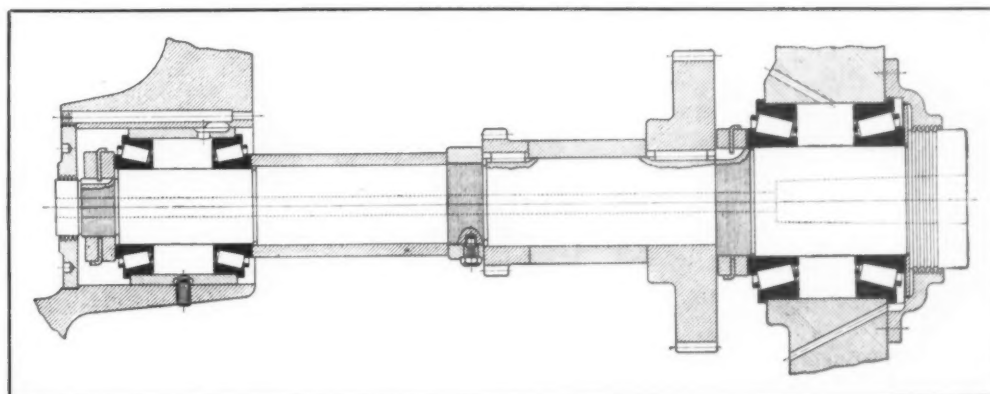


Fig. 4. Milling Machine Spindle Mounted in Two Roller Bearings at Each End

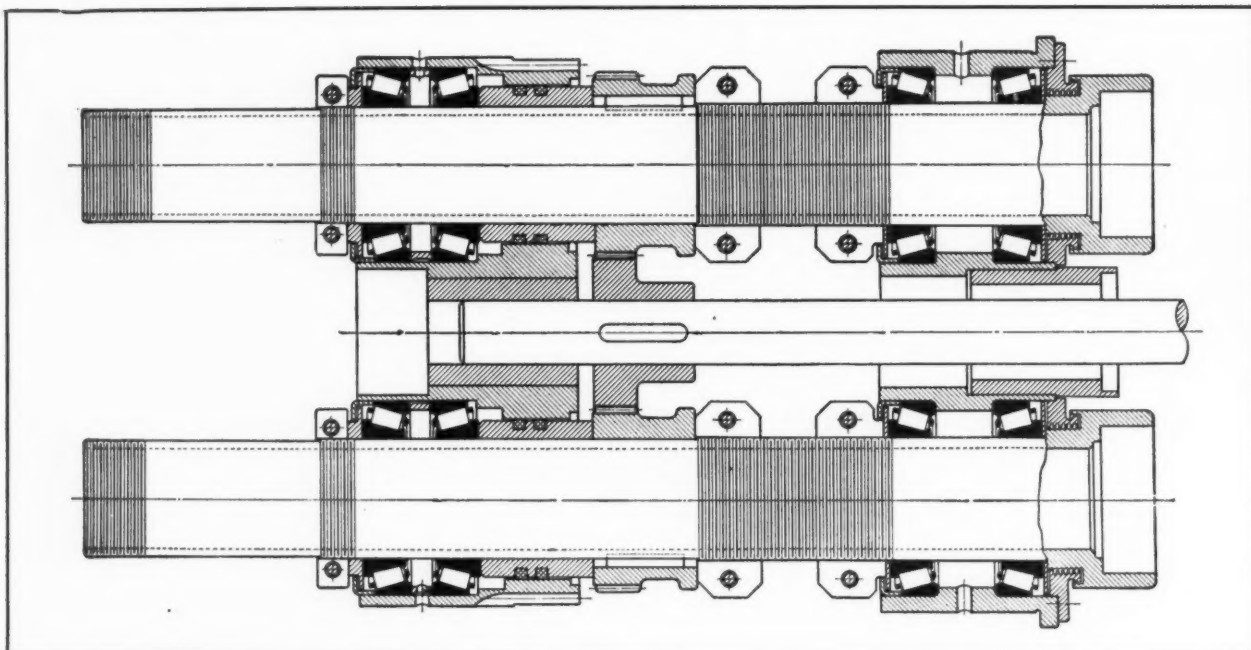


Fig. 5. Typical Mounting Used in a Multiple-spindle Automatic Screw Machine

head and carry both the thrust and heavy radial loads from the cutting tools. The two bearings at the rear are set up by the two nuts shown, and help carry the radial load from the cutting tools and gears. As installed, they float in the case, and consequently are relieved of all thrust loading. This setting takes care of any possible expansion due to temperature.

A series of tests conducted on several lathes demonstrated clearly that the use of these bearings practically eliminated axial run-out, as well as eccentricity and chatter. All the machines tested were doing the same kind of work, and none had been in service less than a year. No adjustments or alterations that might affect the bearings were made.

To compare the performance of these machines with regard to eccentricity of the work and the degree of chatter when taking light cuts, a second test was made. Four 2-inch soft steel bars, 26 inches long, were turned down on centers to a fairly uniform diameter for 24 inches of their length. A bar was chucked in each machine, extending 24 inches from the chuck, without support. Test cuts were made at the free end, at the center, and at the

chuck. A uniform depth of cut of 0.0012 inch was used for all tests. Chatter marks were visible in both the end and center cuts on the plain-bearing equipped machines, but they were practically eliminated on the end cut on the Timken-equipped units, and entirely absent on the other two cuts in the roller-bearing machine.

In Figs. 2 and 4 are shown typical mountings for milling machine spindles. The flanged type bearing shown is preferred by many designers, as it avoids the necessity for counterboring to obtain the conventional cup shoulder. In Fig. 4, the bearings on the right-hand end of the spindle are mounted directly in the column. The utmost accuracy is thus obtained, since it is only necessary to bore straight through the column, and face a seat for the cup flange. Similar precision is obtained in the bearings on the left by grinding a sleeve to the desired accuracy and setting the flanges of the cup against the ends of the sleeve.

A typical mounting in the heads of multiple-spindle automatic screw machines and

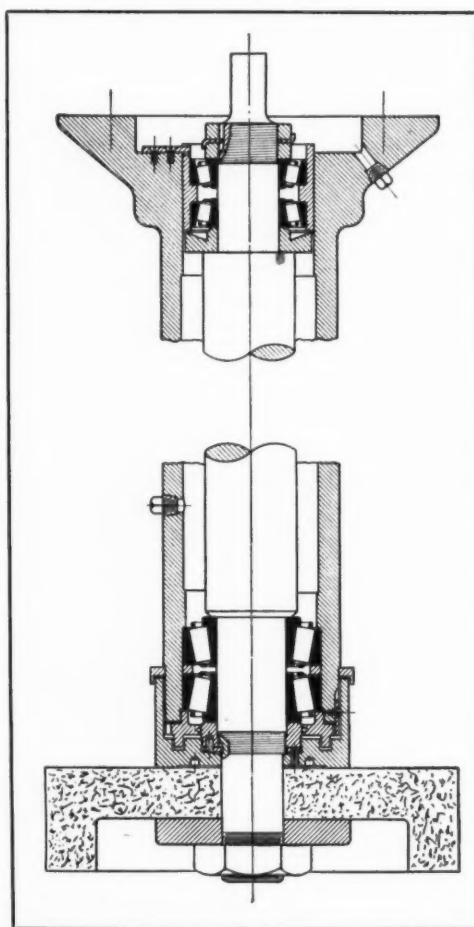
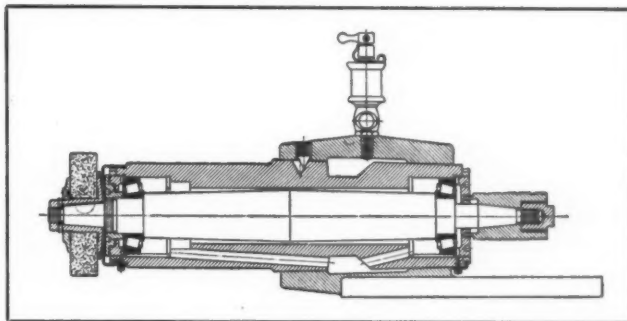


Fig. 6. Mounting for a Vertical Grinding Machine Spindle

Fig. 7. Mounting for a High-speed Internal Grinding Machine Spindle



chucking machines is illustrated in Fig. 5. The two front bearings locate the spindle rigidly, while the rear bearings float in the revolving carrier, thus taking care of the expansion which necessarily occurs in equipment of this type. Thrust and radial loads from the cutting and forming tools are taken by the front bearings and transmitted at once to the carrier, relieving the spindle of stress and maintaining the accuracy of the work.

In installations of this kind, particular care should be taken in designing the closures to keep the lubricant in the bearing chamber and keep out the coolant or cutting compound and chips. The coolant is often heated to fairly high temperatures, which, in turn, heats the spindles, sometimes causing a longitudinal expansion of as much as 1/64 inch. In the lay-out shown, the rear bearings are free to expand longitudinally, thus avoiding stresses due to temperature changes. The closures shown have demonstrated their effectiveness in service.

Grinding Machines Require Carefully Mounted Spindles

Fig. 8 illustrates a mounting suitable for centerless grinding machine spindles. The spindle must be very rigid to carry the heavy wheel at high speeds, and the bearings must be large and well lubricated. Particular care must be exercised in designing the closures at the wheel end of the spindle to keep out grit and grinding compound, which

would ruin a bearing and destroy the accuracy of the machine in a short time, should they enter even in the smallest amount. High operating speeds in this class of equipment cause heating of the spindle, and consequently provision for longitudinal expansion must be made,

as in the case of automatic screw machines. This is done by fixing the front bearings, thus locating the spindle, and floating the rear bearings.

Bearing adjustment and set-up in the mounting shown is secured by means of nuts threaded on the spindle, and locked by means of tongued washers. To attain the maximum degree of precision in the set-up, the standard practice is to preload the bearings. Normal manufacturing limits for both the bore and the outside diameter are plus 0.0005 inch and minus 0.0000 inch, with a maximum run-out of the complete bearing of 0.00015 inch when the cup is rotated on the cone or vice versa.

Fig. 6 shows a vertical grinding machine spindle. The mounting requirements are practically the same as those already outlined, except that special attention must be given to the bottom closure to maintain a proper oil level in the bearings at all times.

High-speed internal grinding machine spindles present one of the most severe bearing applications. The extremely high speeds required and the high-grade finish demanded necessitate the use of bearings of the greatest accuracy and rigidity. Fig. 7 illustrates a typical mounting of this kind, where speeds run as high as 12,000 revolutions per minute. Lubrication is provided by means of a sight-feed oiler, and the bearings are set up with a slight initial drag. For high quality precision

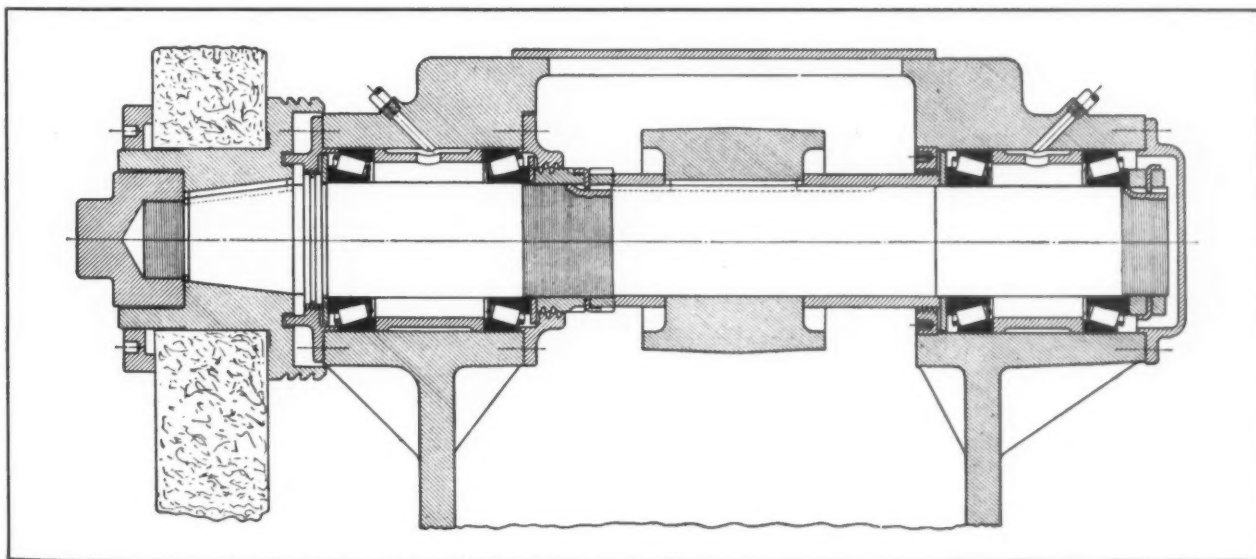


Fig. 8. Mounting Used on a Centerless Grinding Machine

work, it is highly important that the spindle and all rotating parts be well balanced. The bearing cones must be given a press fit on the spindle to eliminate vibration and creeping.

Still another difficult bearing application is illustrated in Fig. 9, which shows the work-head of a grinding machine. The general principle of bearing mounting in this case is the same as for other precision spindle mountings, and the same care must be used in designing the closures. The life of bearings in applications of this general type depends upon the desired quality of the finished work. If the product is to be finished to a high degree of accuracy, the bearings must be set up tightly, and consequently their life will be reduced.

With the increasing adoption of new cutting materials and higher cutting speeds, heavier loads become the rule. This means greater and greater loads on the bearings, yet the demand for quantity

Cooling Small Shop Buildings in Summer

By W. F. SCHAPHORST

In connection with many machine shops, there are often small buildings used for housing repair shops, special clerical work, etc. These buildings are usually built of wood and become extremely hot in the summer. Now that air-conditioning is becoming generally used, it might be well to point out that these small buildings can be kept comfortably cool in hot weather at small cost by applying a simple scientific principle.

It is well known that the evaporation of water "extracts heat"; that is why the evaporation of perspiration keeps the body temperature at the normal level. Therefore, to keep a building cool, make the building "perspire." This is done by run-

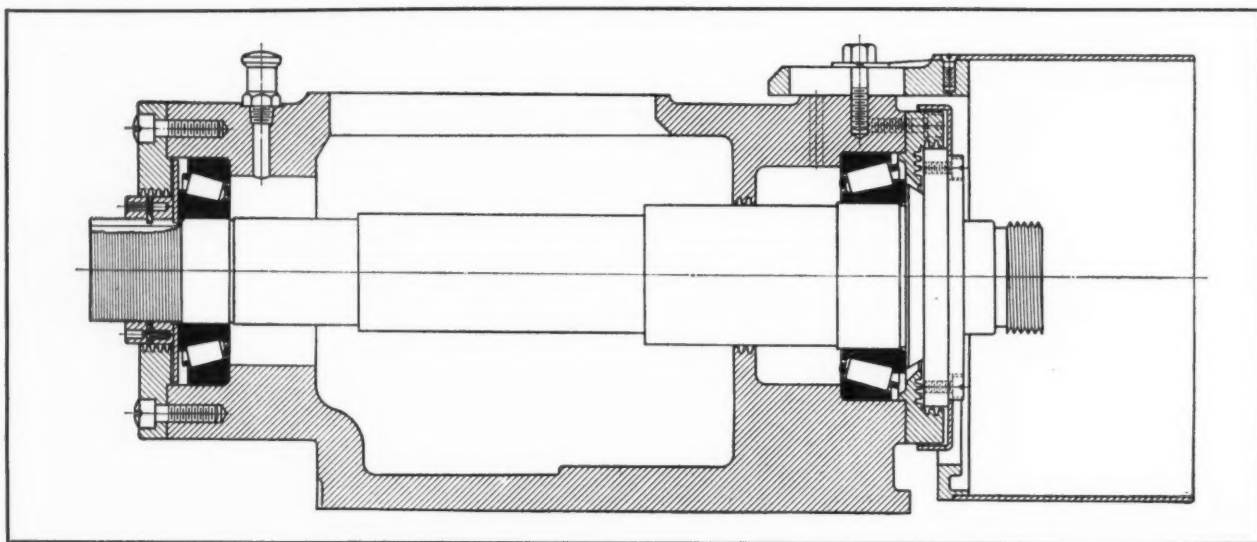


Fig. 9. Mounting for the Work-spindle of a Grinding Machine

production of accurately finished parts and the elimination of chatter and vibration remains. New designs for machine equipment bring up new problems in mounting. The typical mountings illustrated in this article merely suggest the possibilities, and when designers are confronted with new problems involving high speeds, heavy loads, different temperature conditions, or other special or unusual situations, the bearing manufacturers should be consulted.

* * *

Canada is today the most important platinum-producing country, surpassing in this respect Russia, which at one time was the leading platinum-producing nation, and which now takes second place. South Africa is also an important source of this metal. The gold ores of South Africa contain substantial amounts of platinum.

ning a few water pipes along the ridge of the roof and under the eaves—pipes with rows of holes drilled in them, so that the roof and the sides of the building can be kept wet by sprinkling. As soon as the surface of the building is wet, the water is turned off. The amount of water required is not great. The evaporation of the water will tend to cool the building. An automatic device for wetting the outside of the building every half hour or so could be installed at small cost.

The results, of course, will not compare with those obtained with regular air-conditioning equipment, especially in humid weather; but when the humidity is low, this method is a great improvement on no cooling system at all. Where the expense is warranted, real air-conditioning equipment naturally is installed. During the past year, some noteworthy air-conditioning installations have been made in machine shops, that in the Ford plants being described in July MACHINERY.

Four Different Die-Castings from One Set of Dies

By CHARLES O. HERB

WHEN die-castings are comparatively small and are not required in too large quantities, several different pieces can often be cast in one set of dies. Four pieces belonging to this classification are shown in Fig. 1. They are produced simultaneously with each operation of the dies shown in Fig. 2, which were made by the Madison-Kipp Corporation, Madison, Wis., for use on the automatic die-casting machines built by that concern. In Fig. 2, the stationary die appears at the left and the movable die at the right.

The cavities in which the individual pieces are cast are indicated in Fig. 2 by the same reference letters that are employed to identify the pieces in Fig. 1. The gating which connects the various cavities is contained entirely in the movable die. It will be seen by reference to Fig. 2 that metal for producing the long part A is "shot" into the cavity from both ends.

A steel spindle is cast in the hub of part A. This spindle is inserted in hole E of the movable die when the latter is withdrawn from the stationary member. Fine threads are cast on the opposite end of part A by means of hardened inserts K, which are permanently attached to both the stationary and movable dies.

Part D is cast with a narrow slot in one side of the central boss. This slot is produced by core F,

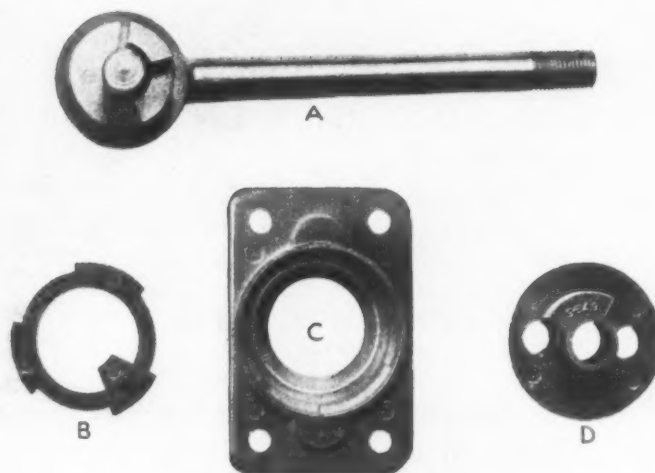


Fig. 1. Four Zinc Die-castings which are Simultaneously Cast in One Set of Dies

which is attached to slide G. The core is pulled from the finished casting when the movable die is withdrawn from the stationary member. This movement of the core occurs as the hole in holder G slides along angle-pin H. When the dies are closed for the next operation, core F is correctly positioned again by pin H. Block J guides the sliding core-holder and fastens it to the front of the movable die.

Standard means are employed for ejecting the four pieces simultaneously from the movable die. This is accomplished by means of fifteen pins attached to a plate at the back of the movable die. In Fig. 2 these pins are shown in the raised or ejecting positions. About three "shots" can be made a minute with these dies. The parts are cast from zinc.

* * *

The metal palladium is being suggested by some leading jewellers as a substitute for platinum for such purposes as cigarette cases, compacts, and other large pieces. Palladium possesses the appearance and nearly all of the other attributes which make platinum so highly esteemed a material for jewelry. It is, however, much lighter and cheaper than platinum, and hence is more suitable for larger articles.

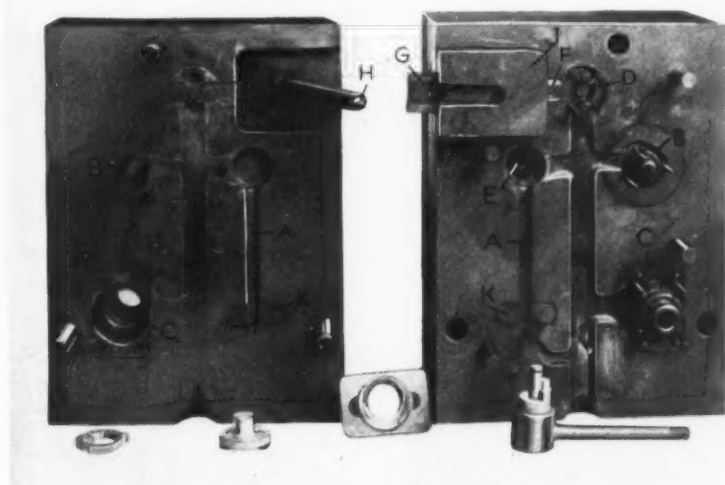


Fig. 2. Dies Designed for Simultaneously Casting the Four Different Parts Shown in Fig. 1

Engineering News Flashes

— The World Over —

Paraffin Engines Successful in England

The Coventry Victor Motor Co., Coventry, England, builders of gasoline engines, are now supplying one of their models equipped to run on paraffin. It is stated that the engines run smoothly on this fuel, with an increase of power output, which, in some cases, has been as high as 10 per cent.

Electric Soldering Baths Improve Product and Cut Fuel Cost in Half

The Phillips Can Co., Cambridge, Md., recently installed electric heat for a continuous seam-soldering process, resulting in the elimination of practically all rejects and in a 50 per cent reduction in fuel costs. The electrification consists of General Electric equipment, replacing pots formerly fired by gas. The former operating temperature was 650 degrees F. It is stated that the uniform temperature distribution obtainable with the electric heat allows a reduction of the operating temperature to between 600 and 620 degrees F. This contributes to longer life of the crucible, causes a sub-

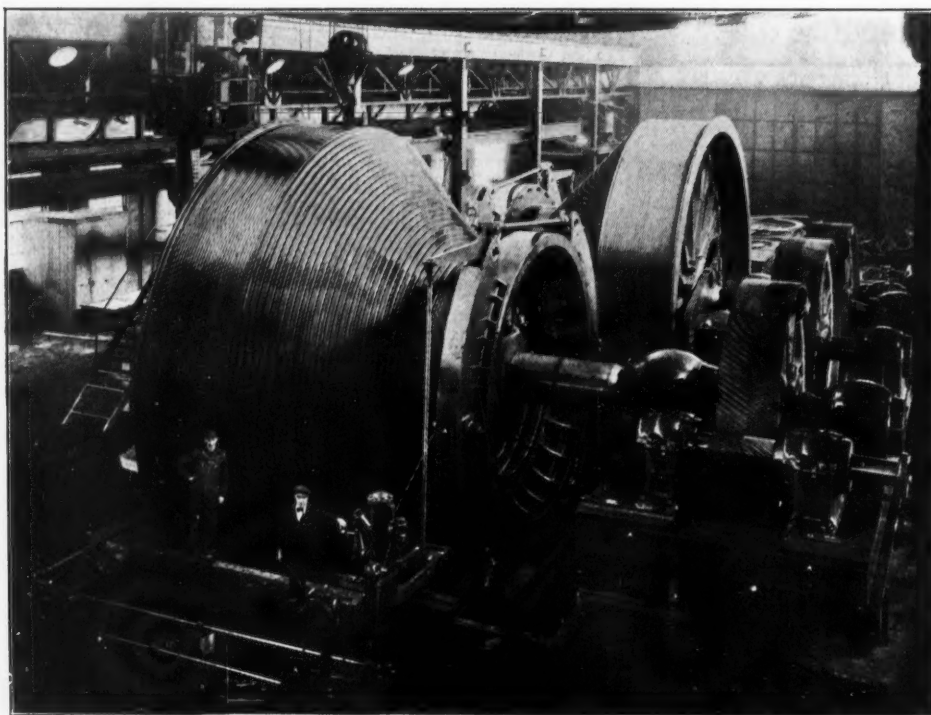
stantial reduction in dross and sludge formation, and reduces radiation losses, as well as the number of rejects, which formerly amounted to several cans a minute.

Copper Pipe 5500 Years Old

According to the Copper and Brass Research Association, a piece of copper pipe was unearthed several years ago at Ghizeh in the pyramid of the Egyptian Pharaoh Cheops, which is approximately 5500 years old and is still in such condition that it will convey water. It is believed that this pipe was used to supply water to the royal bathing pool. A fragment of this pipe may be seen in the offices of the Association at 420 Lexington Ave., New York.

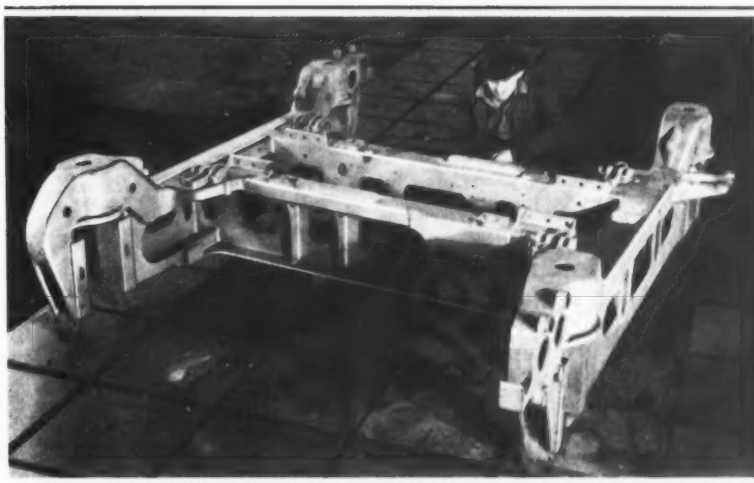
A Giant Mine Hoist

At the Rockfield, Quebec, plant of the Canadian Allis-Chalmers, Ltd., what is believed to be the largest hoisting engine ever made has recently been completed. It is for use at the Creighton Mine of the International Nickel Co. The two conical drums of this hoist are 25 feet in diameter at the largest section, tapering down to 12 feet. They weigh 400 tons each. They are said to be the largest castings ever made in Canada from alloyed iron. The composition of the castings is approximately as follows: Total carbon, 2.7 to 3 per cent; manganese, 0.8 per cent; silicon, 1.75 per cent; and nickel, 1.25 to 1.50 per cent. The high compressive strength of this nickel-alloy



A Mine Hoist of Huge Proportions, Having Hoist Drums 25 Feet in Diameter, Each Weighing 400 Tons

The multi-section cars built by the Edward G. Budd Mfg. Co., Philadelphia, Pa., for the Brooklyn-Manhattan Transit Lines, New York City, are equipped with welded-steel truck frames, bolsters, and spring planks fabricated by Lukenweld, Inc., Coatesville, Pa. The illustration shows a completed welded truck frame weighing 1435 pounds, ready for shipment from the Lukenweld plant



cast iron played an important part in its selection for this installation. Tests show a strength of over 160,000 pounds per square inch in compression, while the tensile strength is 52,500 pounds per square inch, and the Brinell hardness 196 to 217.

Twenty-Two Large Models Tested Before Designing the Liner "Queen Mary"

The thoroughness with which the proportions of a large Atlantic liner are determined and the tremendous amount of experimental work preceding its building are indicated by the fact that for the research carried on before settling upon the dimensions of the new Cunard White Star liner *Queen Mary*, twenty-two models, each 16 feet 8 inches long, were built. With these models some 8000 separate experiments were carried out and recorded. The tank in which this testing was made is fitted with apparatus for producing artificial waves. In testing the ship models, their behavior at sea under conditions reproducing to scale those of a North Atlantic storm was quite accurately determined. Moving picture records were made of the action of the models, some 2400 feet of film being produced. This method of obtaining permanent records proved particularly valuable, as it was possible to make comparisons that mere visual observation and recording would not permit.

Locomotive Burning Butane Fuel

A year of successful operation has proved the practicability of a new type of butane-electric locomotive built by the Plymouth Locomotive Works, Plymouth, Ohio, for the Acme Steel Co., Chicago, Ill. It is estimated that this 65-ton locomotive does 50 per cent more work in a given period than either of the two steam locomotives that it replaced. It is powered with two Climax engines, modified for butane fuel consumption, with electric traction equipment furnished by the General Electric Co. The over-all length of the locomotive is 40 feet;

width, 10 feet; and height over the cab, 14 feet. The two Climax engines produce 250 horsepower at 1200 revolutions per minute.

The adaptation of the Climax engines for butane consumption required a change in compression ratio and modified carburetion features. Butane is loaded into two 125-gallon fuel tanks as a liquid; but at approximately 10 degrees F. and above, the vapor pressure of the liquid forces the fuel, as a gas, into the mixing valves of the engine. Besides low cost, butane has the advantage of forming no carbon and producing no crankcase dilution. The locomotive is reported to consume on an average of 10.75 gallons of fuel and 0.1 gallon of lubricating oil per hour of heavy-duty switching service.

Cellophane Used for Electric Wire Insulation

Recently considerable progress has been made in using cellophane as an insulation for copper wire. Cellophane is made in thicknesses of considerably less than 0.001 inch, and can be produced in narrow ribbons ranging from 1/32 to 1/4 inch in width. These ribbons are put up in packages, the same as silk or cotton yarn, and are used on wire-insulating machines which spin the wrapper around the wire at the rate of several thousand times a minute, laying it on with mathematical accuracy. A special adhesive assures a permanent bond and a top dressing of lacquer completes the job. Laboratory tests have proved the efficiency of this type of insulation, and indicate a saving of about 30 per cent in winding time, compared with the use of cotton. The insulated wire also occupies less space.

It is stated that motors with wiring insulated with cellophane showed that the new type of insulation permits quicker dissipation of the heat generated in the windings and a higher resistance to excessive temperatures than other types of insulation. It also has outstanding corrosion-resisting properties.

EDITORIAL COMMENT

Shop engineering is a very definite branch of the engineering field. Frequently the designing engineers—the men who design the product and who comprise the engineering department—are considered more truly engineers than the men who have

Engineering Required in Manufacturing as Well as in Design

by the engineer who designs the product.

Shop engineering, however, is real engineering, and the men who carry out the engineering conceptions in iron and steel and other materials deserve as much credit as other branches of the manufacturing organization. They, too, have some very real engineering problems to solve. Frequently the success or failure of the designing engineers' ideas depends upon the ingenuity of a master mechanic or equipment engineer, who provides the means whereby the ideas can be materialized. The engineering of the shop is no less important than the engineering of the designing department.

The effect of production machinery in reducing prices, on the one hand, and making possible an increase in wages, on the other, is well understood by all who have given careful thought to the economics of production. It is not so generally understood that advertising has exactly the same effect. It, too, tends to reduce prices and to make possible increased wages—and for exactly the same reason that production machinery effects these results.

Advertising Tends to Reduce Prices and Raise Wages

permit lower prices and higher wages; lower costs mean increased purchasing power and a higher standard of living.

Now advertising, properly directed, does exactly the same thing. It increases sales, so that the greater production of the more efficient machine may be disposed of. Investment in advertising is like the investment in a better machine that will produce at less cost per piece. By increasing the

charge of production—those who design jigs and fixtures, and who create in iron and steel the ideas conceived

sales volume, advertising reduces the sales cost per piece. Instead of increasing the cost of the product, judicious advertising, like efficient machinery, reduces it; and this lower cost can also be translated into lower prices and higher wages.

It is important that this fact be recognized, because it is a common error to assume that advertising raises prices, making goods cost more. It is easy to understand why this belief would gain ground. Large sums of money are spent on advertising and the advertiser must get his money back from his customers; but that is true also of the cost of efficient machinery and manufacturing costs in general. The customers must ultimately pay them. That does not say, however, that the price of the goods is *increased* because of these costs. On the contrary, efficient machinery and good advertising have the very opposite effect; and advertising may well be counted among the factors that tend to raise the standard of living.

The objectionable practice of so-called "reciprocal buying" is frequently called to our attention. This practice has previously been referred to in

Reciprocal Buying Does not Promote Good Salesmanship

been generally discussed—that is, the discouraging effect of this practice on salesmen. Here is a man representing a reputable product, the quality of which is not questioned and the price of which is conceded to be "right." When this salesman finds that goods are bought, not on their merit, but simply because a club is held over the customer's head, he begins to question: "What is the use of quality anyhow?"

Instances have come to our attention where reciprocal buying has forced shops to use products that, in their own opinion, are inferior to what they would have bought, had it not been that the seller was an important customer of theirs, who made it clear that he expected to sell his own product in return for what he bought. This practice does not promote either quality, efficiency, or good will, and should be discouraged throughout industry as far as possible.

MACHINERY and the objections to it have been pointed out. One manufacturer emphasizes a phase of the subject that has not

Ingenious Mechanical Movements

Mechanisms Selected by Experienced Machine Designers
as Typical Examples Applicable in the Construction of
Automatic Machines and Other Devices

Pulsating Rotary Movement for Operating Shell Hopper

By J. E. FENNO

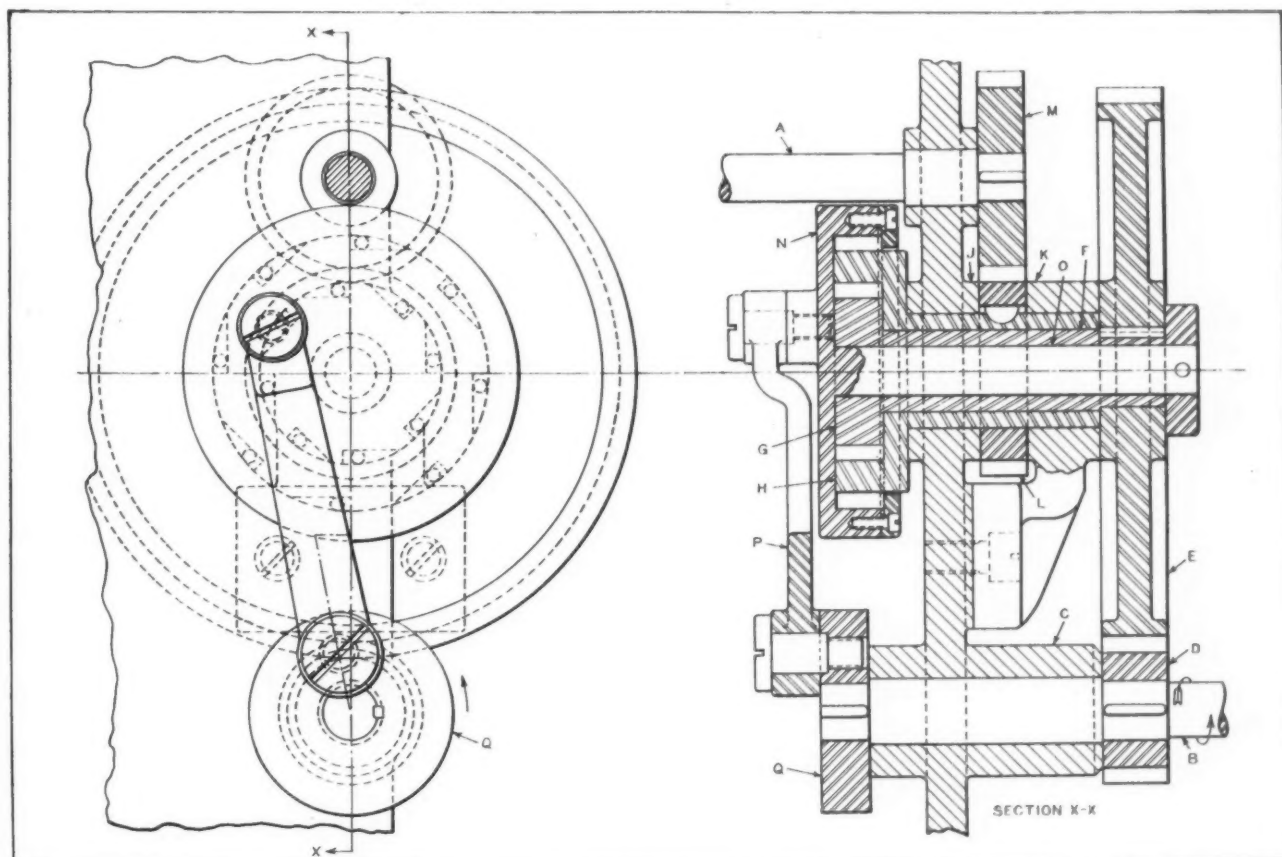
Brass shells are fed to a thread-rolling machine by means of a rotary hopper attached to the machine. After extensive experiments, it was found that a pulsating or variable rotary movement of the hopper drum increased its efficiency; that is, more shells per minute could be fed by the drum when the pulsating movement was used. The mechanism shown in the illustration was designed to give the required pulsating movement.

With this arrangement, the drum is rotated a partial revolution at a slow velocity through a train of gears and a double roller clutch. The remaining

part of the revolution is imparted by a crank which causes the roller clutch to over-run so that the drum rotates at a relatively rapid velocity.

The drive-shaft *B* is supported in the bearing *C*, which is an integral part of the machine. On this shaft is keyed the pinion *D*, which meshes with the gear *E*, keyed to sleeve *F*. The left-hand end *G* of this sleeve forms the core of a roller clutch; the outer ring for this core is indicated at *H*. The sleeve on ring *H* is supported in the bearings *J* and *K*, and its bore provides a bearing for the core sleeve *F*. Keyed to the ring sleeve is the gear *L*, which meshes with gear *M*, keyed to the drum shaft *A*.

It will be noted that ring *H* forms the core for the second or outer roller clutch, the ring for this clutch being indicated at *N*. The long shaft *O*, in-



Mechanism by which the Shaft *B*, Rotating at Constant Speed in One Direction, Imparts a Pulsating Rotary Movement to Shaft *A*

tegral with this ring, is a free fit in the bore of core sleeve *F*, and a collar at its right-hand end serves to lock in position all the members supported in bearings *J* and *K*. On an offset boss on the side of ring *N* is pivoted the connecting-rod *P*, the lower end of which is connected to the crank disk *Q*, keyed to shaft *B*.

As shaft *B* rotates one-half revolution in the direction of the arrow, core *G* turns in a clockwise direction (see end view), rotating ring *H* and gear *L* with it. As a result, gear *M* and drum shaft *A* turn at a constant velocity in a counter-clockwise direction. In the meantime, crank *Q*, through rod *P*, rotates ring *N* in a counter-clockwise direction; but, as the clutch rolls between members *H* and *N* are free at this time, this movement does not affect the movement of shaft *A*. However, as soon as shaft *B* completes one-half revolution, the crank reverses the rotation of ring *N*. Now as this ring rotates at a much higher velocity than core *G*, the rolls between members *G* and *H* will be released, so that ring *H* will over-run and rotate gears *L* and *M* and drum shaft *A* at a high velocity. This high velocity of shaft *A* continues until shaft *B* has completed its second half revolution, after which the

movement of ring *N* is again reversed, thus permitting the rolls to wedge between members *G* and *H*. This will cause member *H* to rotate the drum shaft at the slow velocity. There is practically no over-run of the drum when its velocity changes from high to low, owing to the frictional contact of the drum with the shells in the hopper. These slow and fast movements of shaft *A* are repeated alternately, imparting the required pulsating movement to the hopper drum.

Swivel Joint Mechanism for Changing Direction of Movement

By F. SERVER

Although the mechanism shown in the accompanying illustration, designed for changing the direction of movement transmitted by a lever, is not suitable for use where considerable rigidity is required, it nevertheless has much to commend it where the force applied is comparatively small.

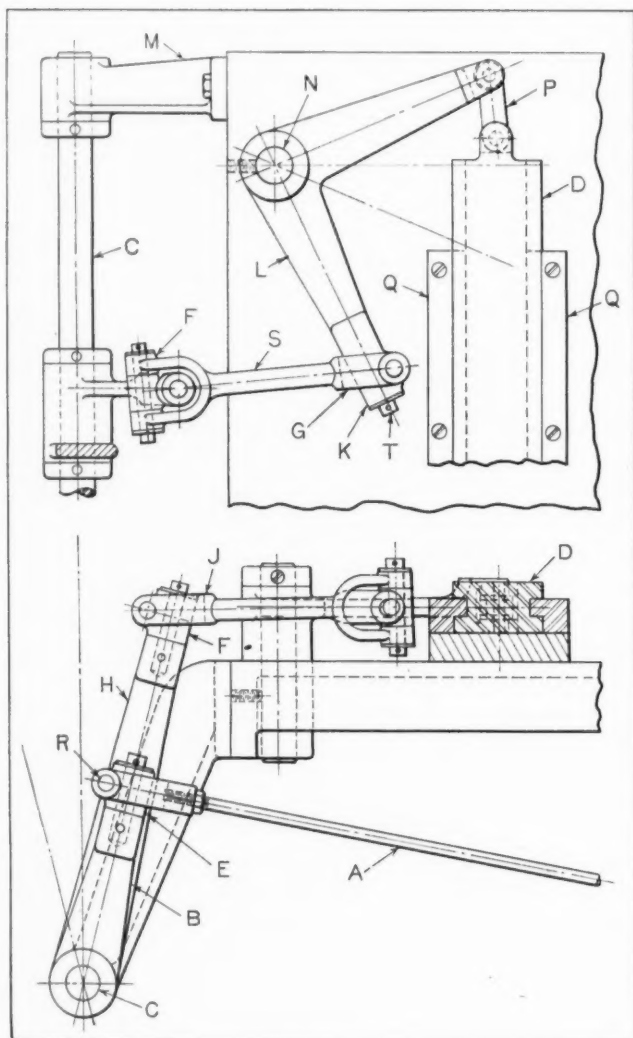
The illustration shows one corner of the machine table on which the mechanism is used. The rod *A* has a reciprocating movement, rocking lever *B* about shaft *C* as a fulcrum. This motion is transferred by the mechanism to a horizontal reciprocating slide *D*. There is a swivel link unit at *E* on the end of lever *B*. Lever *H*, being an integral part of the hub of lever *B* in the form of a separate arm, is also rocked back and forth by rod *A*.

Swivel joints *E* and *F*, of which *S* is a connecting-rod having a second swivel joint at *G* working in conjunction with the swivel link *K*, transmit motion in a horizontal plane to a rocker lever *L*. Lever *H* is supported on shaft *C* by two brackets *M*, the one at the front end of the shaft not being shown.

The horizontal lever *L* pivots on stud *N*, transmitting motion to link *P*, which, in turn, transmits the required reciprocating movement to slide *D*. Slide *D* is held on the base of the machine by means of guide plates *Q*. The opposite end of slide *D* serves to actuate transfer plates in the proper sequence of operations performed by the machine.

The principle involved in the swivel connections at *E*, *F*, and *G* is the same in all instances. The link *E* carries a pivot pin *R*, held in place by means of a washer and cotter-pin. This permits an up and down rocking movement of rod *A*. It also permits a rocking action of the joint forward or back, as well as sidewise, in the horizontal plane. The joint *G* at the end of the connecting link *S* allows a swiveling motion in the horizontal plane, while pin *T* permits a swiveling motion in the vertical plane.

Therefore, regardless of the inclination of the connecting links or the variations in height due to the radial action of the several rocking levers, movement is transmitted from the rod *A* to the



Swivel Joint Mechanism by which Rod *A* Operates Slide *D*

slide *D*. While the mechanism appears somewhat complex because of the many angles involved, it nevertheless often provides the simplest arrangement for obtaining the desired results.

Variable Feed Arrangement for Automatic Wheel-Dressing Device

By JOHN A. HONEGGER

The actuating screw of an automatic wheel-dressing device employed on a grinding machine was designed to move the dressing diamond a given amount each time it functioned, but there was no provision for varying the amount of this movement. Variations in the hardness and bonding of a grinding wheel, however, make it desirable that the amount of feed or movement of the truing diamond be adjusted to suit individual grinding wheels and the conditions under which they are used. The accompanying illustration shows an arrangement designed to permit such adjustment. With this device, the feed can be varied any desired amount by adjusting the bar *E*.

Referring to the illustration, slide *A* is moved a fixed amount in the direction indicated by the arrow each time the actuating screw *B* functions. Mounted on slide *A* at right angles to each other are two plungers *C* and *D*. Plunger *D* is kept in contact with plunger *C* by means of the coil spring. Plunger *C*, in turn, is kept in contact with the adjustable bar *E*. The bar is also held in a fixed position by the pressure exerted by the spring.

The angle of the bar is adjusted by means of screw *F* which can be clamped in place by a locknut. The diamond-holder *G* is kept from rotating by means of the key *H*, which slides in a keyway cut in slide *A*. The amount of movement imparted to holder *G* by a given movement of screw *B* is determined by the angular setting of the sine bar *E*.

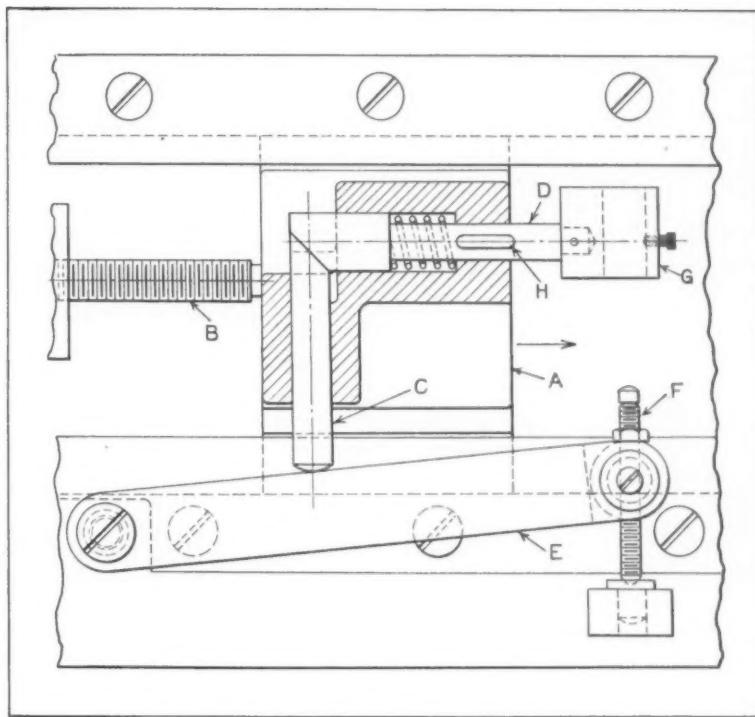
* * *

Ball Bearings on Out-of-Round Shafts

By JOHN E. HYLER

Ball bearings give so little trouble in general that it is not surprising that they are subjected to much abuse. The mounting of a ball bearing on a shaft that is out of round is one form of abuse, however, which may cause failure periodically. Such failures, occurring through no fault of the bearing itself, are a source of mystery and trouble to anyone who does not suspect the cause.

When a bearing is pressed on an out-of-round



Feed for Automatic Dressing Device Used for Truing Grinding Wheel

shaft, it is deformed and must run in a deformed condition. No matter how slight the deformation, there will be tight and loose spots within the bearing when it is in operation. On light-weight spindles and shafts, this condition can sometimes be detected by throwing off all belts and machine connections and turning the shaft or spindle by hand. Part of the time it will turn easily, but there will be brief periods when increased resistance to the turning motion can be detected.

The working life of a bearing operating under such conditions at relatively high speed will be greatly shortened. The magnitude or amount of deformation will naturally determine the seriousness of the condition. There is only one way to guard against such failures, and that is to test the shaft and seat for roundness and make sure that any out-of-round shaft is corrected before installing the bearing.

* * *

Engineering Association Changes Name

The name of the Association of Iron and Steel Electrical Engineers has been changed to the Association of Iron and Steel Engineers. The reason for the change is that, while the Association was first formed to promote the development of electrical equipment used in the steel industry, it has later branched out until it now covers a much broader scope of activities. The Association was formed in 1907. It has made many major contributions to the development of present-day steel-making practice.

Boring, Facing, and Chamfering Gear-Pump Bodies

BOTH single and double type gear-pump bodies used in a well-known oil burner are being bored, faced, and chamfered accurately and rapidly on a Heald No. 48 Bore-Matic equipped as shown in Figs. 1 and 2. The fixture consists of a rigid casting, mounted on the cross-slide attached to the main table. The fixture can be indexed crosswise to two different positions by means of a hand-lever to provide for boring both sides of the rotor chamber, and is securely locked by another lever.

* Various adapter plates used in conjunction with locating studs or a hand plug, such as shown in the fixture plate to the left in Fig. 1, are employed to locate the work. The single pump body is located by a hand plug, and the double body is positioned by studs in the fixture plate. After the work has been located on the adapter plates, it is locked in place by means of a clamp actuated by the hand-levers shown in Fig. 2 at the rear of the fixture.

The cycle of operations on single pump bodies consists of locating two pump bodies by means of locating plugs, locking them in the fixture and then performing the boring, facing, and chamfering operations. Two "Red Head" boring heads with

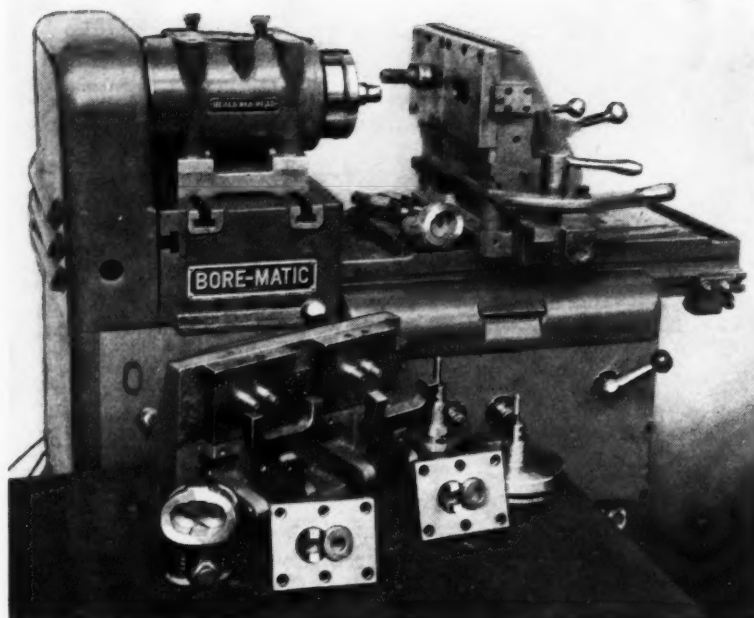


Fig. 1. Fixtures and Boring Spindles Used in Machining Gear-pump Bodies on a Heald Bore-Matic

three-tool quills rough-bore the large hole, face the bottom of the hole, and bore the small hole in both bodies in one operation. The fixture is then indexed at right angles to the machine spindles for duplicating the operations on the other side of the rotor chambers, thus completing the rough machining operations on the rotor chambers of the two pump bodies.

After these rough operations, the two pump bodies are again placed in the fixture and finishing tools used to finish-bore the large hole and finish-face and finish-bore the small hole in both pump bodies in one operation. The fixture is then indexed, and the finishing operations are duplicated on the second set of holes, thus completing the machining of the rotor chambers in two pump bodies.

In Fig. 3 is shown a Heald No. 49 double-end Bore-Matic equipped for boring extra long pump bodies when close tolerances on depth, concentricity of widely spaced holes, and extremely accurate alignment are required. The pump body is held in a fixture that can be indexed to two positions by rotation about an offset axis to bring both gear-shaft holes in the rotor chamber into alignment with the boring spindles.

The method used for accurately maintaining the depth of the rotor chamber in the facing operation is of particular interest. The pump body is located in the fixture from its back face. However, in order to overcome the wide tolerances between the front and back faces, the body must be gaged from the front face. This variation in width is read from

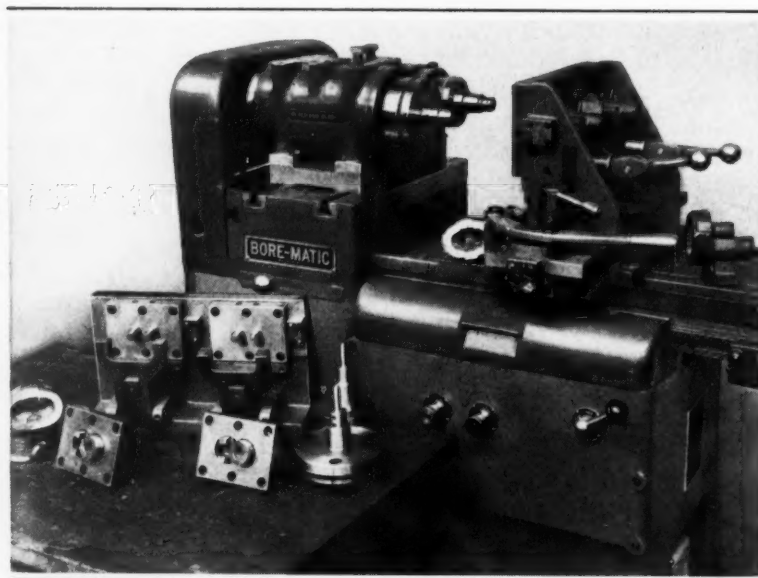


Fig. 2. View of Bore-Matic Showing Rear of Work-holding Fixture

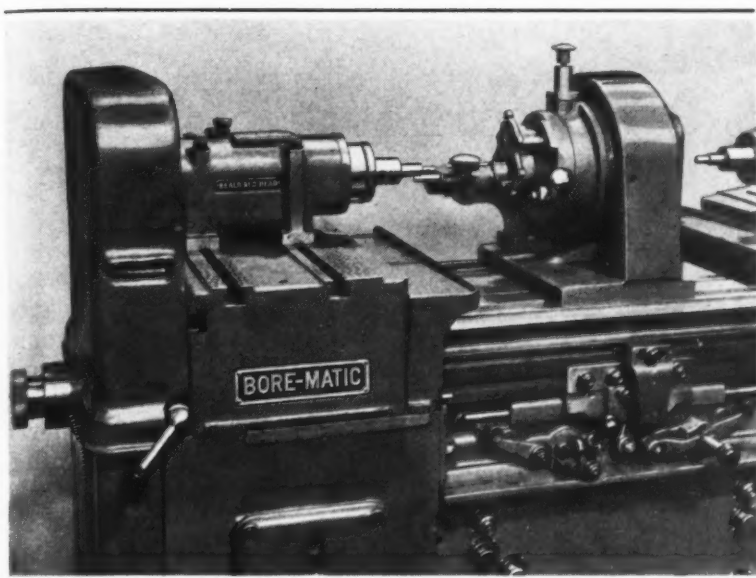


Fig. 3. Double-end Bore-Matic Equipped with Indexing Fixture

the indicator shown, which can be swung down from the fixed axis in a bracket attached to the fixture. The end-stop, shown at the left of the machine, is then adjusted to the exact equivalent of this indicator reading. By this means, the depth of the rotor chamber is held to very close limits, regardless of the variation between the two faces of the pump body.

A three-tool quill is used to bore a 2-inch hole, face the bottom of the bored hole, and bore a 7/8-inch hole in one operation. The fixture is then indexed, and these operations are duplicated for the other side of the rotor chamber. On the opposite end of the pump body, a single-tool quill bores a 7/8-inch hole, thus assuring very close concentricity for the two holes, which are approximately 10 inches apart at opposite ends of the work.

* * *

Broaching Integrally Cast Main Bearing Caps

One automobile manufacturer casts four main bearing caps in one piece and cuts them apart after they have been machined, thus greatly reducing work-handling time in a number of operations. The illustration shows a single-ram broaching machine equipped on the left-hand side for finishing the joint faces of these semi-steel bearing castings and the flat sides of the castings as well, directly from the rough, before the journal bearing radius is finished.

On the right-hand side of the ram are two broaches for cutting narrow keyway-like oil slinger slots on the largest of the main bearing caps, which is located at one end of the casting. The broaching machine and its equipment were supplied by the Colonial Broach Co., Detroit, Mich. The machine

is of 15 tons capacity, and has a stroke of 36 inches.

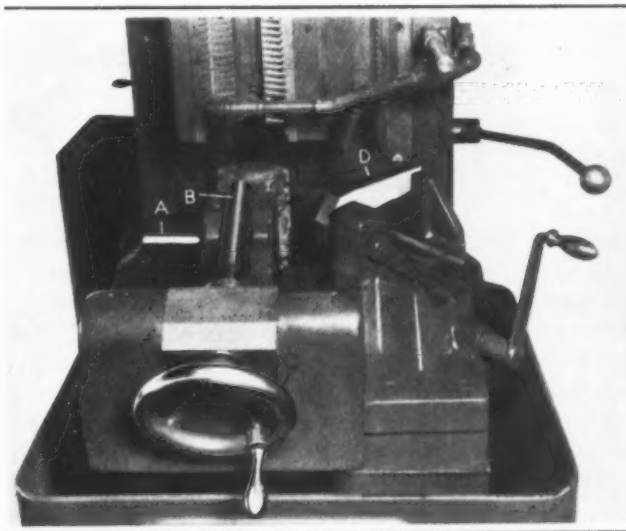
The bearing casting has an over-all length of 5 7/8 inches. The two side broaches on the left-hand side of the ram are 3 1/8 inches wide to suit surfaces of that width by 1 1/4 inches long at one end of the casting. The broaches cut to a width of 7/16 inch for the remaining length.

The left-hand fixture is seen in the loading position. The work is placed on a slide which is quickly moved into and out of the broaching position by means of handle A when screw B is swung upward, as shown. With the work pushed forward beneath the broaches, screw B is swiveled downward into line with a clamping block, which is then forced against the work by turning handwheel C. The work is gripped between the clamping block and a half-round upright. The slide that supports the work

is moved about 4 inches into and out of the broaching position.

After each casting has been broached in the left-hand fixture, it is transferred to the right-hand fixture and located from the previously broached surfaces, which register against hardened and ground blocks. The casting is accurately located lengthwise by turning the crank-handle to lower arm D into the position shown. This arm is provided with a V-shaped block on the under side which is entered into the space between two bearing caps of the casting. The work is thus brought in line with the broaches, and an in-and-out movement is not required.

One bearing cap casting is completely broached with each downward movement of the ram. The production averages 400 caps an hour.



Broaching Equipment for Finishing Four Surfaces and Cutting Two Oil Slinger Slots on Main Bearing Caps

Questions and Answers

Firm's Responsibility for Salesman's Promises

P. D. F.—Recently one of our salesmen took an order. He did not inform us of all the details; in fact, he made a separate written agreement with the purchaser guaranteeing satisfaction. Now the purchaser says the machine is not satisfactory. Are we liable on a guarantee of this kind made by the salesman without our knowledge? What is the legal relation of salesman and manufacturer?

Answered by Leo T. Parker, Attorney-at-Law
Cincinnati, Ohio

The law is settled in all jurisdictions that a salesman has no authority to make a binding contract of sale without the approval or acceptance of his employer, unless he is expressly so authorized. A salesman has authority to solicit orders and transmit them to his employer, but up to the moment that the employer actually accepts the order, no valid contract exists. Therefore, notwithstanding printed or written provisions in a printed order form to the contrary, a purchaser may cancel his order at any time before the salesman's employer actually accepts the order. Also, it has been held that when a purchaser gives notice to cancel an order to the same salesman who took the order, it is the salesman's duty to communicate this notice to his employer. [24 P. (2d) 384]

However, any special agreement between the purchaser and the salesman's employer is valid. If it is agreed that the salesman has authority to make valid contracts, the purchaser is bound to fulfill the terms of the contract as soon as the contract made with the salesman is signed.

Now, with respect to the specific question asked, a valid contract is not completed if the salesman does not transmit the *complete* agreement to his employer for acceptance, although the employer accepts the part of the agreement sent in by the salesman. These important points of the law were decided in the case (March 22, 1935) of *Floor v. Mitchell* [41 Pac. (2d) 381].

In this case it was shown that the salesman took two written agreements from a purchaser. He failed to send both to his employer, who accepted the one received. The Court held that the employer could not hold the purchaser to the agreements, and decided that the purchaser was not obligated to make payment for the merchandise, because a

A Department in which the Readers of MACHINERY are Given an Opportunity to Exchange Information on Questions Pertaining to the Machine Industries

valid contract had not been completed, as the seller had not and could not accept the exact offer submitted by the purchaser, which is necessary under all circumstances to complete a valid contract. Therefore, since the salesman failed to notify his employer of all details of the agreement with

the purchaser, the latter was privileged at any time to cancel the agreement. Obviously, the employer also had the same privilege, but he did not know it, as he thought a valid contract existed.

Composition of Crankshaft Cast Iron

C. S.—We use unalloyed air-furnace cast-iron crankshafts in a small industrial engine which we manufacture and have noticed considerable variation in the physical properties, particularly in the Brinell hardness. We would appreciate advice on an alloy iron for this purpose.

Answered by the Editor of "Nickel Cast Iron News,"
Published by the International Nickel Co., Inc.

Below are tabulated the composition and physical properties of a nickel-molybdenum cast iron especially suitable for crankshafts, large and small.

	Large, Per Cent	Small, Per Cent
Total Carbon	2.75	3.00
Silicon	1.90	2.30
Sulphur	0.08 max.	0.08
Manganese	0.75	0.55
Nickel	1.50	1.00
Molybdenum	0.75	0.50

The physical properties of standard American Society for Testing Materials test bars are: Tensile strength, 55,000 to 65,000 pounds per square inch; transverse strength (18-inch supports), 2900 to 3400 pounds. This type of iron has uniform physical properties and good resistance to impact. The modulus of elasticity is from 20,000,000 to 24,000,000. It has excellent wearing qualities and good machineability.

* * *

The 35-ton manganese-bronze propellers that drive the new liner *Queen Mary* are the largest ship propellers ever cast in a single unit.



Die for Punching Two Holes in Tubing Simultaneously

By BEN CLARK, Newark, N. J.

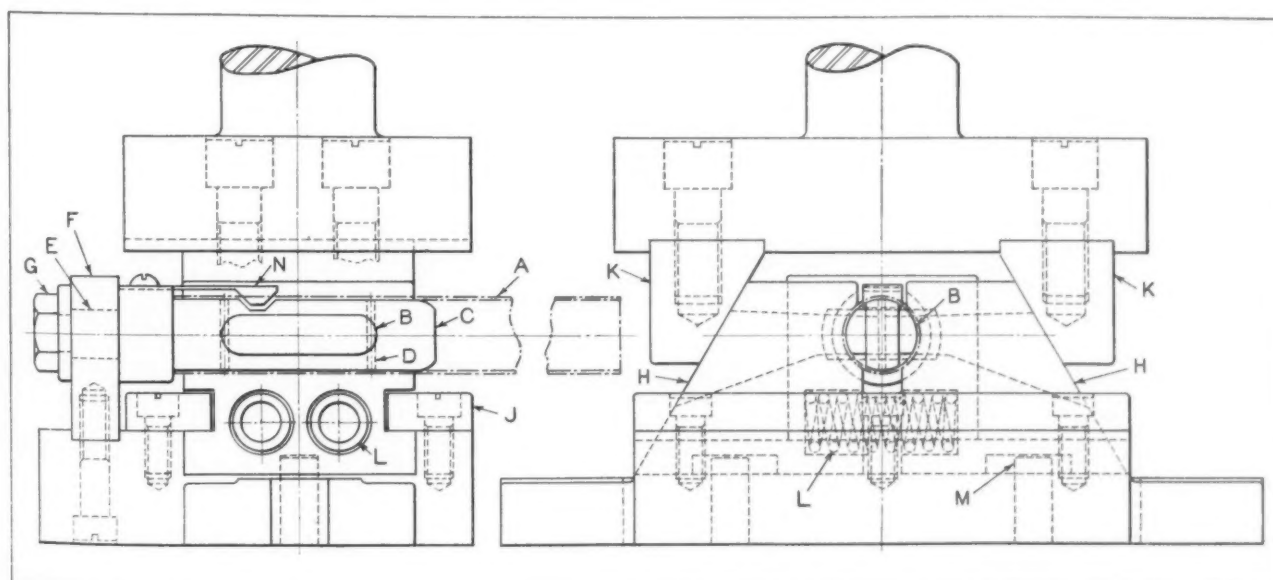
In November *MACHINERY*, page 197, there was shown a die used in punching four equally spaced slots in tubing, one slot at a time. This was considerably faster than the hand milling method first employed, but the continually increasing demand made it necessary either to install another punch press or devise a different means of increasing production on the existing machine. The punch and die shown in the accompanying illustration, which punches two slots at one time, proved to be the solution of the problem.

At *A* is shown one of the seamless steel tubes ready to be punched. This tube has a length of

15 inches, an outside diameter of 1 inch and a wall thickness of 1/32 inch.

Punch *B* is inserted in a slot in the horn *C* with its two cutting ends extending beyond the slabbled sides of the horn. It is held in place by pins *D*. The horn *C* is mounted in a guide slot *E* in block *F*, and is held in place by the collar-nut *G*, which allows it to slide slightly in a lateral direction and yet maintains sufficient rigidity in the vertical plane to keep the cutting ends of punch *B* in line with the openings in the dies *H*.

The dies *H* are mounted in a slide, being held by gibs *J*. The side view, to the left, shows the assembly with one of the dies removed. The front view, to the right, shows the complete assembly, ready to start the perforating operation. The sliding dies are forced in by the beveled blocks *K* mounted on the punch-holder. A further downward movement of the punch-holder forces the dies against opposite



Die that Punches Four Slots in Tubing in Two Strokes of Press

sides of the tube, which is distorted sufficiently to allow the ends of the punch to pierce the two holes simultaneously. The slugs are pushed through the die-blocks and eventually slide out at the sides of the die.

The springs *L* force the dies apart against stops *M*. The natural "springiness" of the steel tubing, plus a little manipulation of the tubing by the operator, serves to strip the work from the punch. The tubing is then given a quarter turn, which allows the locator *N* to drop into one of the slots already punched. The slotting operation is completed by again tripping the press. About 0.007 inch of clearance is allowed where the tube fits over the horn of the die. The punches have 0.015 inch shear. The dies move inward just far enough to insure piercing clean-edged holes, care being taken to avoid a greater movement of the dies than necessary. If the dies move in too far, the natural "springiness" of the work will be overcome, causing the tube to be distorted so that another operation would be necessary.

Automatic Two-Way Air Valve for Operating Turret Clamp

By GEORGE L. PYRITZ, Tool Designer
Schwitzer-Cummins Co., Indianapolis, Ind.

An air valve of interesting design for automatically controlling an air-operated diaphragm used to clamp the turret of a lathe in the working position is shown in the accompanying illustration.

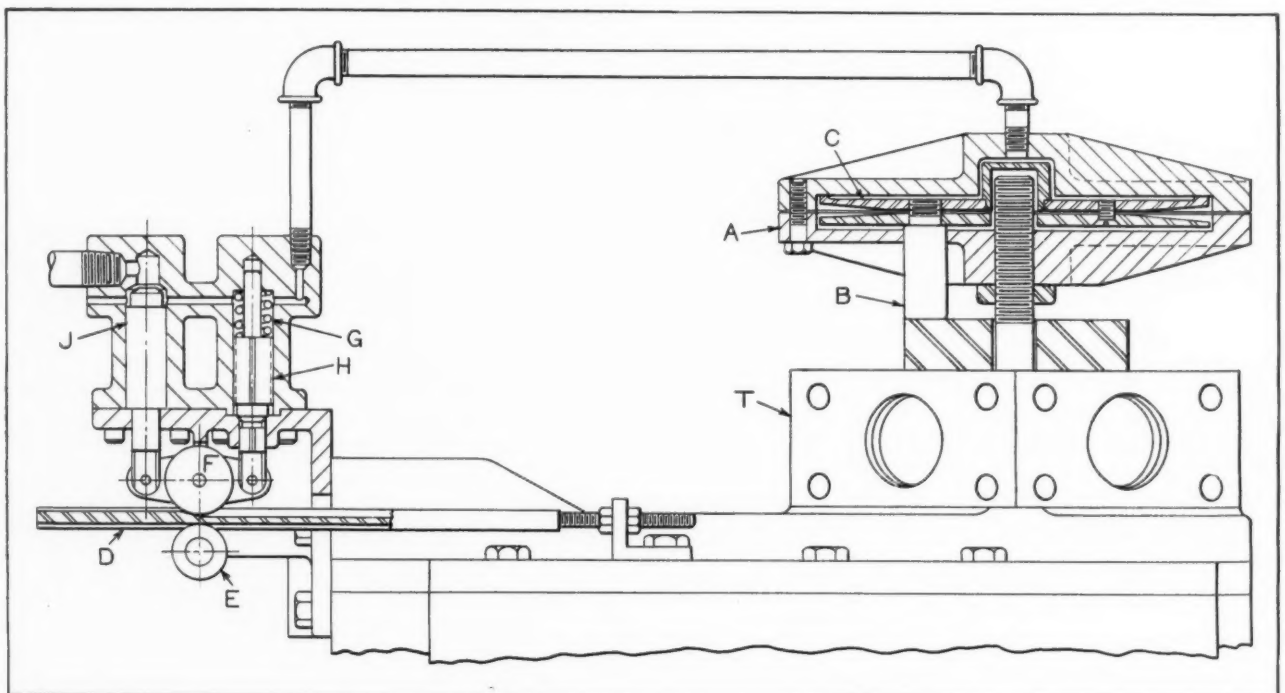
This equipment was developed for use on turret lathes that were being modernized in an Indianapolis plant.

The housing *A* of the diaphragm clamp is screwed on the binding post of the turret *T* in place of the hand nut. It is held in position by a lock-nut, about 0.005 inch clearance being allowed between the ends of the pins *B* and the top of the turret when in the free position. The pins *B* are fastened to the diaphragm plate *C*.

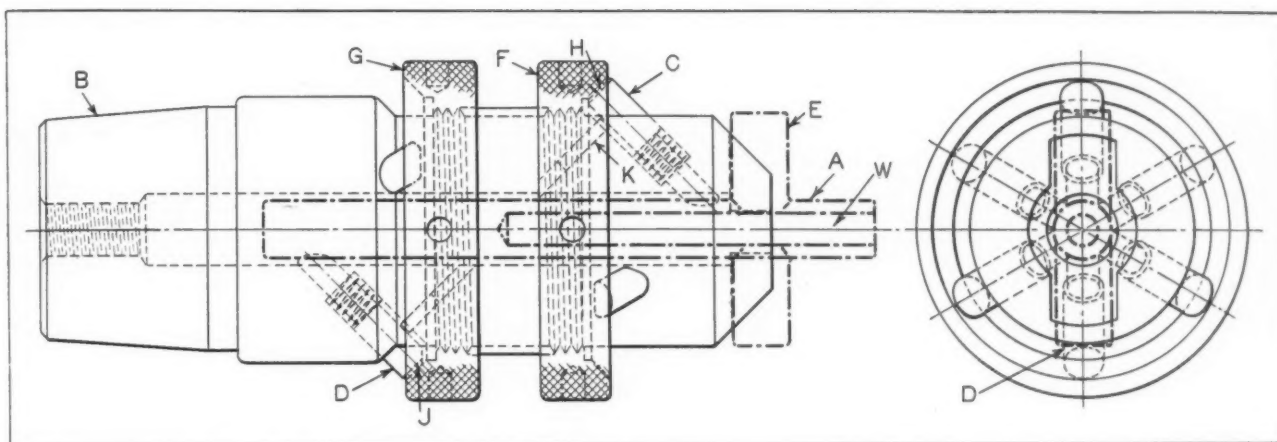
When air is admitted to the chamber above the diaphragm, the pins are forced down against the top of the turret, while an upward pull is exerted on the binder post. As the diameter of the diaphragm is 7 3/4 inches and the air pressure used is 100 pounds per square inch, the total pressure exerted is almost 5000 pounds, which is sufficient to bind the turret securely. The diaphragm has a very short movement and the air space is small; consequently, little air is used.

The valve is mounted on the end of the turret ram and moves with it. The cam-bar *D*, which has tracks for the rollers *E* and *F*, is secured to the bed of the machine. The lower roller *E* supports the cam-bar, while the roller *F*, which rides up and down the incline, operates the air valve.

When the ram is moved to the right or the working position, the roller *F* moves down the incline in the track of the cam-bar. As the roller moves down, the spring *G* forces the plunger *H* down, and at the same time, holds the plunger *J* up until plunger *H* reaches its seat. The continuous pressure from the air line upon plunger *J* is then allowed to force it down away from its seat, permitting air to pass through the valve to the di-



Air Valve and Clamp Designed to Automatically Bind Turret to Slide on Forward Stroke and Release the Binding Pressure on the Return Stroke



Chuck for Holding Long Casting while Drilling Deep Hole

aphragm. This requires only a fraction of a second and allows no air to escape.

When the ram is moved in the opposite direction and the roller *F* moves up the incline, the plunger *J* is forced up until it seats, thus shutting off the air supply. As the roller continues up the incline, it pushes the plunger *H* off its seat and allows the air in the system to pass out through the exhaust opening. With the two valves opening and closing in the order described, practically no air is wasted.

This equipment is inexpensive to make and has been found to speed up the operation of the turret lathe and to conserve the energy of the operator.

held in contact with the beveled surfaces of the sleeves. Small pins *K* prevent the bevel-ended pins from turning.

In making this holder, the pins are ground radially on their inner surfaces by internal grinding after assembly, so that their work-contacting surfaces are equally distant from the center of the chuck. With this construction, it is only necessary to start the hole *W* carefully by first centering the end of the work and then drilling, in order to have the hole practically concentric with the rough outside diameter. Holes for a spanner wrench are provided in the knurled sleeves for convenience in tightening the pins on the work.

Chuck with Two Sets of Jaws for Centering Long Casting

By F. SERVER

The problem of chucking a long casting so that it would run true at both ends while drilling a deep hole concentric with the rough outside surface led to the design of the chuck shown in the accompanying illustration. The casting *A* is held in the body of the chuck and the chuck is mounted in a chucking machine by means of the taper shank *B*, which is tapped for a draw-back rod.

The work is about 9 inches long, and if gripped in a three-jaw chuck at one end only, there would be no assurance that the opposite end of the work would run true. Therefore, it is gripped at each end by three pins, making a total of six pins operated in two units of three each.

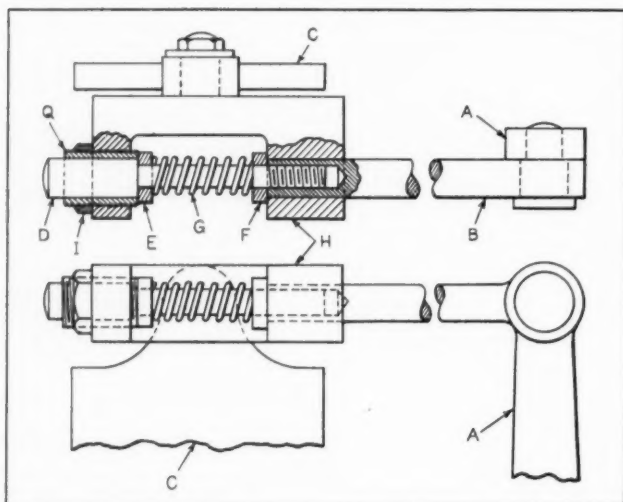
The three equally spaced pins *C* grip the work just in back of the two bosses *E*. The bosses fit into a slot in the end of the holder and act as drivers. The pins *C* and *D* are tightened against the work by the knurled sleeves *F* and *G*, the beveled surfaces inside of these sleeves pressing against the pins at *H* and *J* and forcing them inward so that they grip the work and centralize it at each end. When the sleeves *F* and *G* are released, coil springs force the pins back, so that they are always

Pressure Equalizing Attachment for Wire-Forming Slide

By L. KASPER, Philadelphia, Pa.

The tools on a special wire-forming machine are mounted on a slide that is operated by a rod arranged to apply pressure at both ends of the stroke through a helical spring. Originally, a separate spring was used for applying the pressure at each end of the stroke. As difficulty was experienced in keeping the springs at an equal tension, the attachment shown in the accompanying illustration was devised, which has only one spring. The spring in this case is compressed at both the pull and the push stroke, thus maintaining the same pressure at each end of the movement.

As lever *A* moves to the left, slide *C* moves with it until the forming tool strikes the wire to be formed. Continued movement of lever *A* causes the end of rod *B* to push washer *F* to the left, compressing spring *G* against washer *E*. The tension thus built up in spring *G* is transmitted to the wire through the slide. As the lever moves to the right, washer *F* is again seated against the end of yoke *H*, and the shoulder on stud *D* pushes washer *E* to the right, so that the spring tension acts on slide *C* in the opposite direction.



Pressure Equalizing Attachment for Slide

Stud *D* is threaded to fit the end of rod *B* and is screwed in until the required tension is obtained. In adjusting stud *D*, the washer *E* moves away from the end of yoke *H*. The threaded sleeve *Q* is then set against washer *E* to close up this space and thus eliminate lost motion.

Die Arranged for Economical Production of Pierced and Blanked Parts

By FRANK SERRAL

The economical production of parts from flat strip stock necessitates the selection of material in a width that will give the greatest number of parts per square inch of surface, and at the same time, permit the use of a die of simple construction and adequate strength. The accompanying illustration shows how these problems were solved successfully in the case of a rectangular pierced and blanked part. The material from which the blanks are cut comes in 10-foot lengths and is wide enough to permit the blanking out of two rows of parts with the punch *A*.

The flat stock at *X* is fed through the die from right to left. It enters a slot in the stripper plate *B* until it is located against the finger-stop *C*. The hole *D* is pierced by punch *E* with the stock in this position, after which the operator releases the stop *C* and presses in stop *F* for locating the stock for the first blanking operation. The pilot *H* enters the previously pierced hole in advance of the blanking punch *A*, thus accurately locating the stock, so that even spacing of the blanks is insured.

After the first piece has been blanked out, the finger-stop *F* is released and the stock pushed along until it is located by the automatic stop *K*, which is forced

into the blank opening, as indicated in the upper view. From this point on, the stock is located by stop *K* for each successive blanking stroke of the press.

A screw in the punch-holder of the press strikes against the automatic stop *K* at its outer end *P*, so that it is lifted out of the opening in the stock at each down stroke of the press. As the punch ascends, spring *Q* forces the automatic stop against the upper side of the stock, so that it automatically drops into the next blank opening.

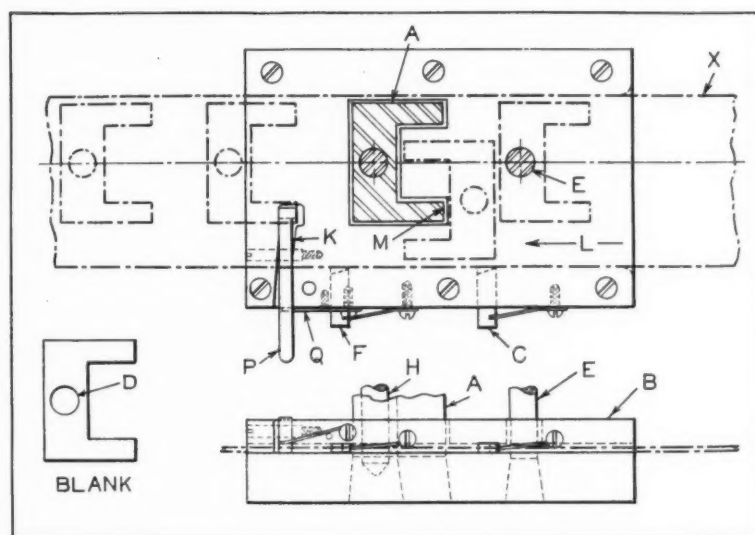
After passing the stock once through the die, it is turned end for end and passed through the same die a second time. The procedure of locating the work against the finger-stop *C*, then stop *F*, and finally against the automatic stop *K* is repeated until all of the blanks are cut from the stock.

* * *

Chromium-Plated Cutting Tools

The chromium plating of gages is firmly established and the chromium plating of cutting tools is steadily gaining ground, although in many instances, the latter application may still be said to be in its experimental and development stages. The reason that chromium-plated cutting tools have not always proved successful has been largely due to attempts to chromium-plate tools not properly designed for plating.

The general impression that chromium, due to its hardness, adds to the actual hardness of the cutting edge seems to be erroneous. Experience indicates that chromium does not materially increase the hardness of the cutting edge, but it does increase the durability to a decided extent, and thereby improves the cutting efficiency of the tool. The subject will continue to interest tool manufacturers and large users of tools, and doubtless, within the near future, more definite results will be recorded on the basis of experiments being made.



Double Pass Type of Blanking and Piercing Die

Ideas for the Shop and Drafting-Room

Time- and Labor-Saving Devices and Methods that Have been Found Useful by Men Engaged in Machine Design and Shop Work

Emergency Dividing Engine for Graduating Small Disks

The simple dividing engine shown in the accompanying illustration was rigged up for use in graduating some small dials with 500 division marks per revolution. The vital part of this device is a 12-inch, 50-tooth gear from an engine lathe. The baseplate *A* has a stud *C* which fits the shaft hole in this gear. An arm *B* also fits over the stud and is provided with a plunger *E* which fits snugly between the gear teeth and is held in place by a helical spring.

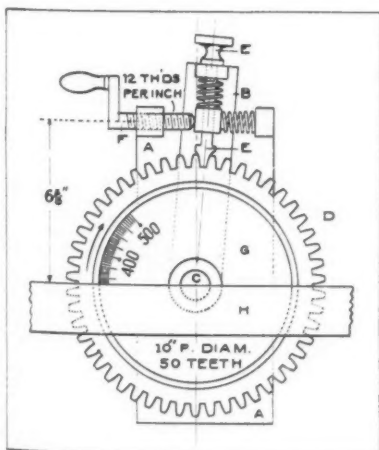
The baseplate *A* carries a screw *F* having twelve threads per inch. This screw is placed at such a distance from the center that one turn of the handle pushes the arm *B* one five-hundredth of a revolution. After ten turns, the plunger *E* is drawn out and dropped into the next space.

The distance of this screw from the center is figured as follows:

$$\frac{10 \text{ (turns of the screw)}}{12 \text{ (threads per inch)}} \times 50 \text{ (teeth)} = 41.66 \text{ inches}$$

which is the circumference of the circle at this point. The radius of a circle of this circumference is $6 \frac{5}{8}$ inches, as indicated in the illustration. As the axis of the screw *F* is tangent to this circle, the spacing will not be theoretically correct, but the error is so slight that it does not need to be considered in this case.

The dials were fastened to the gear with screws while being graduated. They were of sheet steel, enameled white, and the graduations were made with a ruling pen on the straight-edge *H*, using waterproof drawing ink. The figures were put on



Device for Graduating Small Dials with Five Hundred Divisions

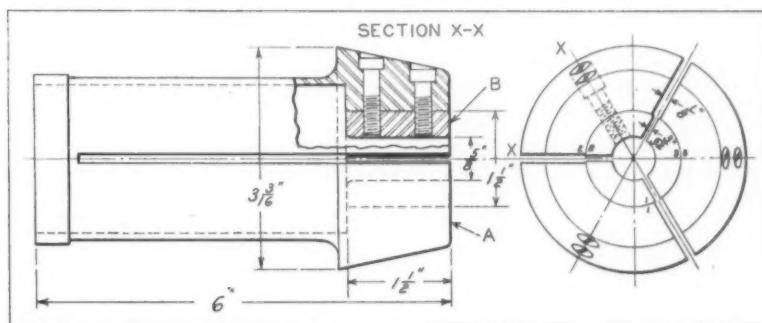
with rubber stamps and the impressions touched up with ink while they were still wet.

Rutland, Vt.

WILLIS H. SARGENT

Bushing Large Collets for Use on Small Work

Finding it necessary to tool up a large screw machine for short runs on small parts, the writer made up a master collet *A*, as shown in the accom-



Large Collet Adapted for Holding Small Stock

panying illustration, and equipped it with bushings *B*. By having several sets of these bushings, it was possible to avoid the expense of a set of large-body collets. Of course, the master collet will also hold $1 \frac{1}{2}$ -inch stock.

The countersunk holes for fastening the bushings were made before hardening and grinding the collet body. The bushings were machined, fitted in the collet, and fastened in place before being cut into three segments with a saw thin enough to avoid rubbing the sides of the slots in the hardened collet. Each bushing segment is stamped with its size and is marked to insure proper assembly before being hardened. For extreme accuracy, the bore of the bushing segments is ground after assembly, the collet being mounted in the machine spindle and a toolpost grinder used.

Millersburg, Pa.

R. A. DRESSLER

* * *

The "putting-on" tool used to be a standard shop joke. Now the electric arc and gas flame make "putting on" possible.

Quantity Production of One Hundred Different Parts by Two Machines

That Some High-Production Machines can be Profitably Applied to Small Runs of Work, is Emphatically Proved by the Example Here Given

HIGH-PRODUCTION machine tools are generally thought of in connection with large quantities of work of one kind, but many high-production machines are not necessarily limited to so narrow a field of application. For example, the Barnes Drill Co., Rockford, Ill., recently supplied two Hydram drilling, boring, and reaming machines to an agricultural machinery plant. These machines between them will handle one hundred different kinds of parts.

Each of these machines is equipped with a hand-indexed table provided with Barker wrenchless chucks, as shown in Figs. 2 and 3, for holding the work. Each chuck jaw is made with two steps on both ends, so that by turning the jaws end for end, each set of jaws is adapted for handling parts of four different shapes. The jaws are readily interchangeable to suit work of different shapes and sizes. One machine is arranged with a three-spindle head and is provided with four chucks, so that one chuck is always in the loading station. The other machine has a two-spindle head and three chucks.

An idea of the variety of work handled will be gained from Fig. 4. Various roughing and finishing cuts are taken simultaneously on these parts, including boring, reaming, drilling, counterboring, and facing. Most of the tools are piloted in bushings held in overhead jig plates.

Hydram machines are equipped with a ram that is hydraulically actuated for feeding the multiple-spindle head to and from the work. The hydraulic system can be controlled so as to provide different sequences, as, for example, a rapid approach; a slow feed for drilling, reaming, counterboring, etc.; a dwell for facing; and a rapid return. A foot-pedal at the right of each machine is depressed to permit indexing the table, while a second pedal at the left is depressed to start each operating cycle.

Fig. 2 shows one of these machines set up for handling small barrel-shaped castings. These

parts are bored to two diameters in the first station and are also faced at the top end and on the wide shoulder at the bottom of the large hole. This hole is reamed in the third station, the second being idle. One piece is finished at each indexing.

Both machines are equipped with a chip sweeper which is attached to the table, as seen in Fig. 1. This device extends into the table trough and as the table is indexed, it carries the chips around the trough to an opening at the rear. Various spindle speeds can be obtained by changing pick-off gears.

These machines replaced eight old machines of a different type. Only two operators are now required instead of the eight that ran the previous machines. The saving in labor cost is at least \$9000 a year.

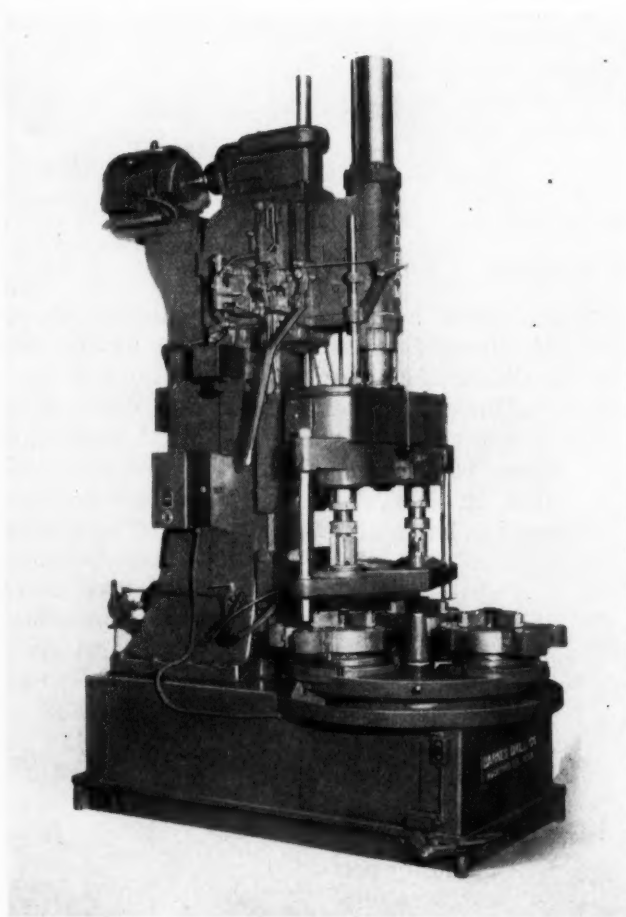


Fig. 1. One of Two High-production Machines Equipped for Handling One Hundred Different Pieces of Work between Them

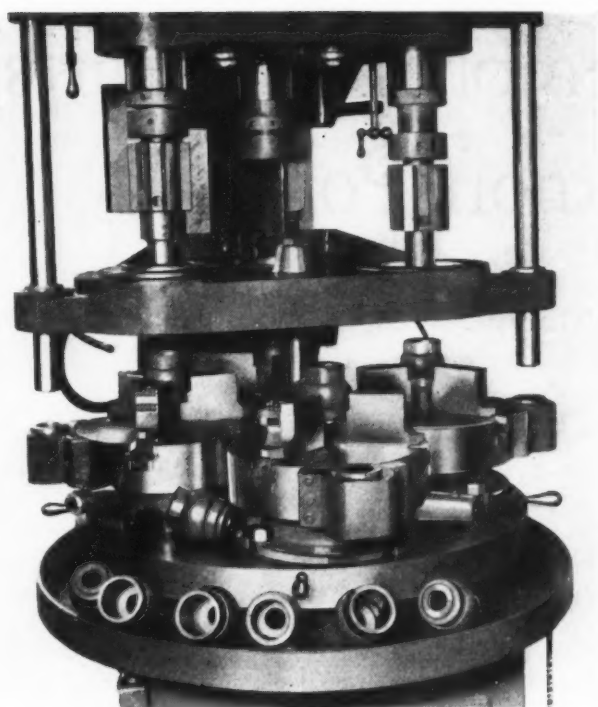


Fig. 2. Each Jaw of the Barker Wrenchless Chucks is Made with Four Different Gripping Surfaces so that Each Set of Jaws is Suitable for Four Different Parts

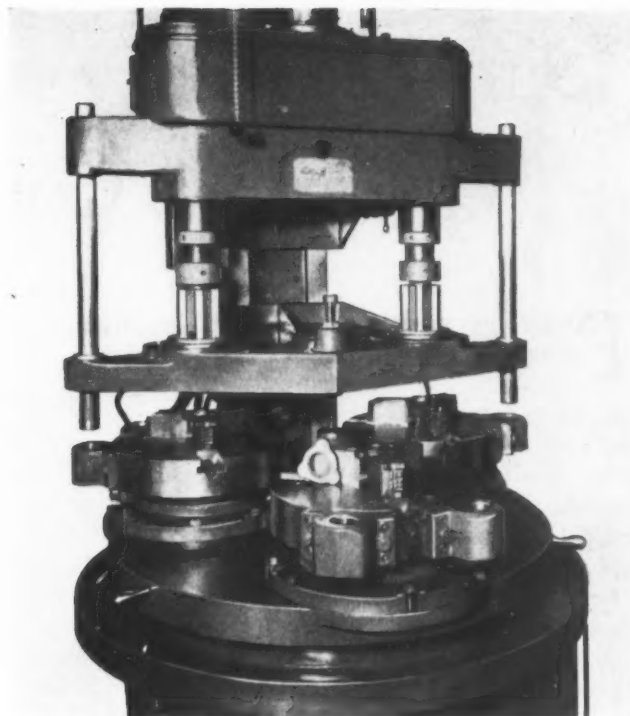


Fig. 3. High Production is Obtainable with These Machines on Small Runs of Work because of the Facilities Provided for Quickly Changing the Tools and Chuck Jaws

Fig. 4. Typical Examples of the Large Variety of Work that can be Quickly Accommodated by Two Hydram Machines in a Plant Engaged in the Manufacture of Agricultural Machinery



Dimensioning Assemblies and Parts from a Common Point

THOSE engaged in the manufacture of watches and other precise mechanisms are more or less acquainted with the system of dimensioning detailed and assembly drawings here described. Although the system has been used primarily for small parts, there is no reason why it cannot be successfully applied to large work, such as automobile engines, for example, and even to work of a non-precision type.

Fig. 1 shows the application of the system to the detailed drawing for a minute-wheel pawl used in

Elimination of Cumulative Errors, Assurance of Interchangeability, and Proper Functioning of Machine Parts are Advantages Claimed for This System

By C. W. HINMAN

several types of watches made by the Elgin National Watch Co. All dimensions are established from common horizontal and vertical lines outside the finished part. The dimensions for all the tools used in the fabrication of the pawl are also worked out from the same lines. This results in the

production of very accurate, interchangeable parts.

In the case of one particular part, not shown, which is a complicated working member of an Elgin watch, the dimensions are all given from lines entirely outside the outline of the part itself.

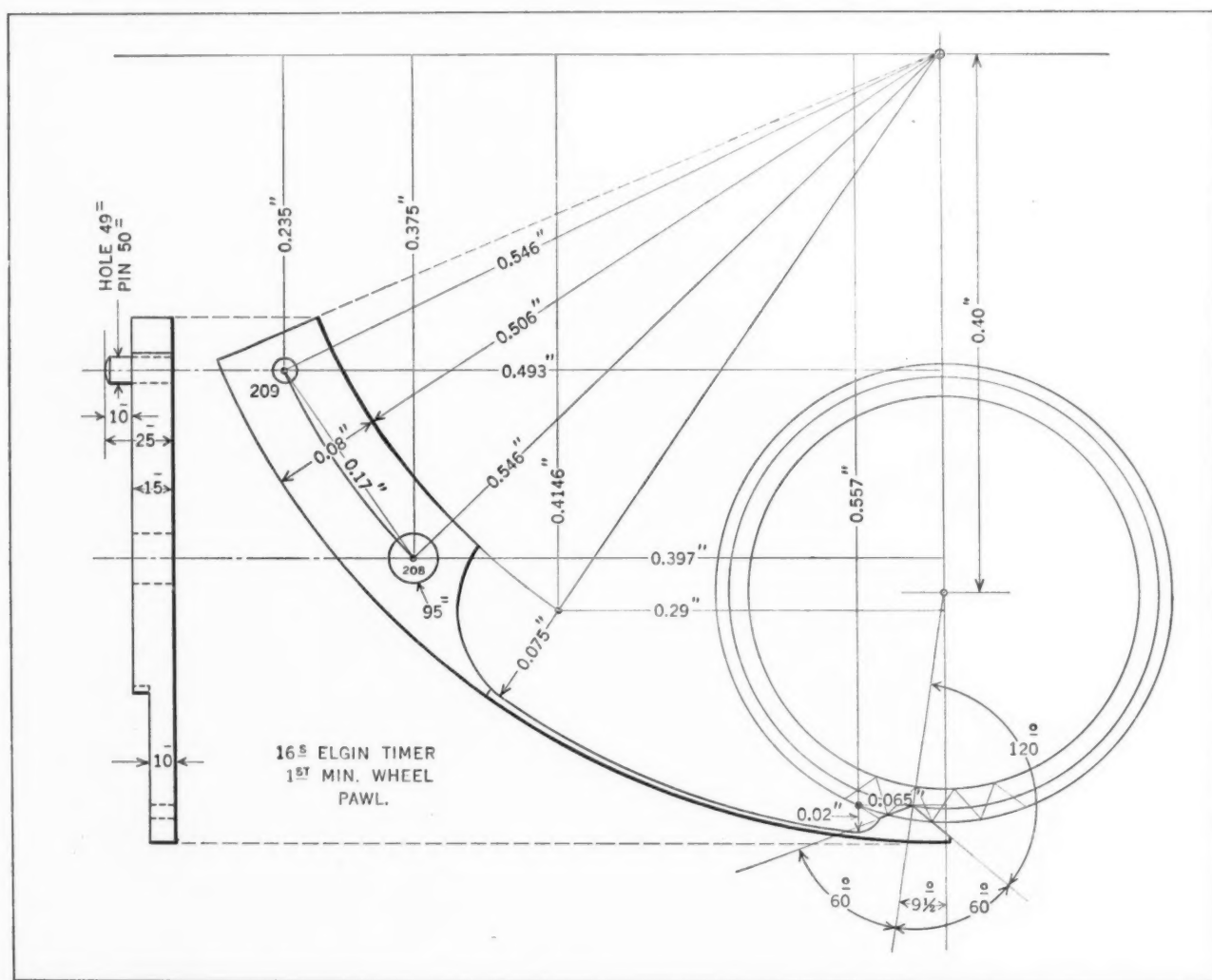


Fig. 1. Detailed Drawing of Watch Pawl, Dimensioned by Step Method from Correlative Outside Lines

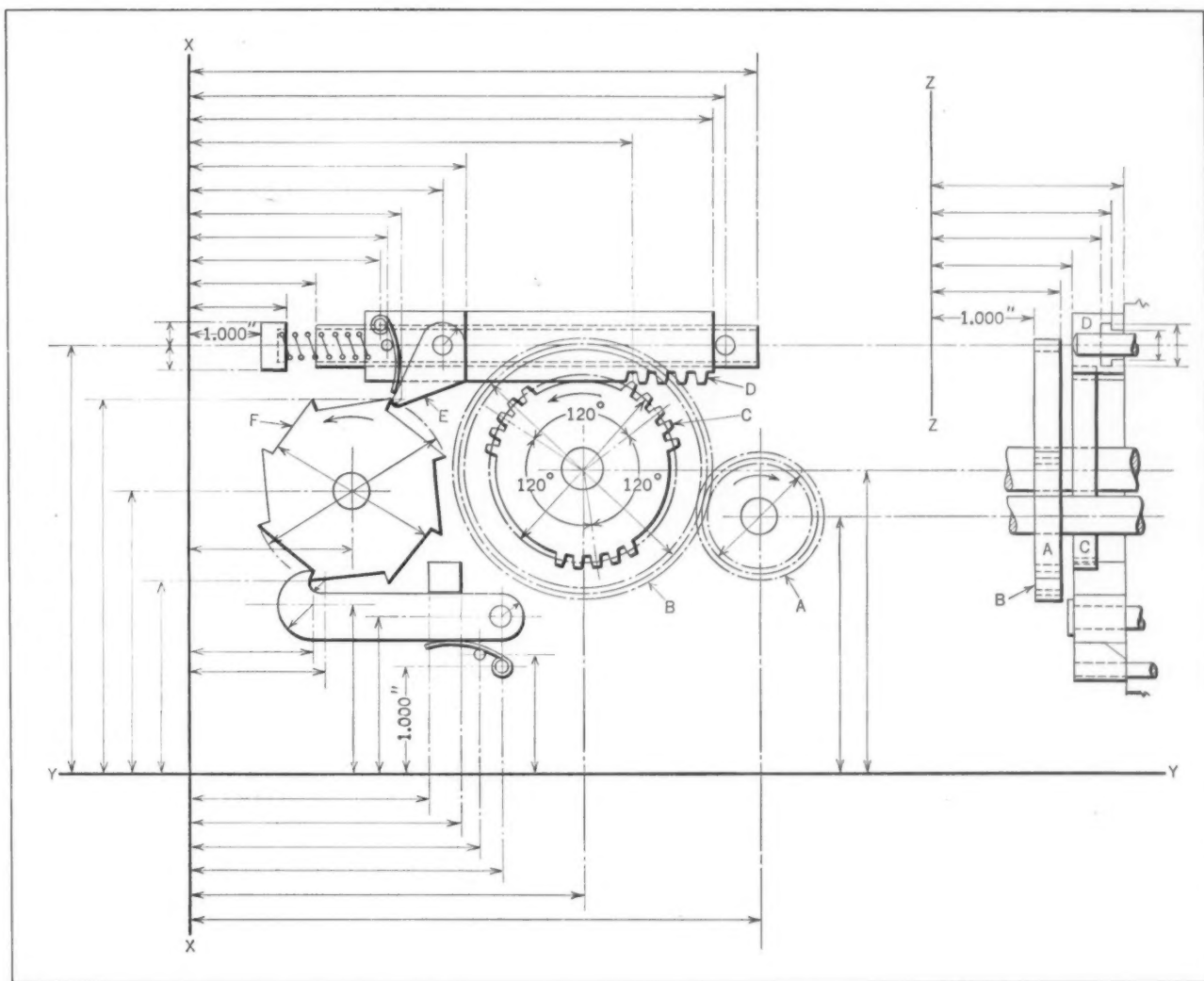


Fig. 2. Step Method of Dimensioning an Assembly, which Establishes Positions of Mating Parts from Same Base Lines

These outside lines are coincident with the center lines of the completed watch, of which the part is a member. Dimensions for the tools and gages are all given from the same common points; hence, the product is machined to function properly in its correct position in the assembly.

To produce delicate calibrating instruments, or small machines of the high-precision type, composed of very accurate and perfectly interchangeable units, it is necessary to abandon conventional methods. For such work, the method of dimensioning all parts, and especially the working centers, from a common point is a great advantage.

Application of Common-Point Dimensioning System

The method outlined can also be adapted to dimensioning assembled mechanisms, such as illustrated in Fig. 2. Referring to this illustration, gear A drives gear B and the intermittent gear C, which advances rack D. Pawl E attached to rack D operates the toothed wheel F. This mechanism is shown with the parts in the positions they occupy at the beginning of the operating cycle. Base lines

X-X, Y-Y, and Z-Z are established, usually 1.000 inch from the nearest point dimensioned.

In detailing parts, the same "step" dimensioning as is used for the assembly is employed. The step dimensions are taken from the same base lines. The measurements between the steps can also be shown if desired. Step dimensioning of individual parts smooths out the differences between shop and engineering departments and eliminates the complaint that the engineering dimensions given on drawings are inconvenient for shop use.

If drilling, milling, or press tools are to be made, all the step dimensions required for performing the necessary jig boring operations are given on the blueprint for each individual piece. If blanking die templets are wanted, this type of dimensioning is exactly suited to the needs of the shop.

Time is saved in designing tools by having the step dimensions given on the piece drawings. Checking is simplified, because the position of a piece is determined by the same base line figures on the detailed drawing as on the partial and final assembly drawings. With this system, all the dimensioning for each independent unit can be determined from the assembly drawing.

Accumulative errors are entirely eliminated. Changing dimensions of individual parts is possible with the least interference with the dimensions of other parts. When other parts are affected, this system affords the best means for detecting such conditions.

In operations such as drilling, milling, turning, and grinding, or in the designing of press tools and gages, the system provides a dependable standard from which to lay out the tools or to check the relationship between the tool and its work. This system is applicable to mechanisms of any size, from a wrist watch to a gasoline motor. It facilitates the setting of clearance tolerances between working members, because each operating condition stands in plain figures before the designer.

Advantages of System when Dies are Required

This method has another advantage when detailing blanks for press tool parts from assembly views. An example is shown in Fig. 3. Since the assembled apparatus is dimensioned with the different parts located in the positions they occupy at the beginning of the cycle of operations, the circular arc measurements of the center line of each part can be determined from horizontal or vertical base lines.

By drawing lines from each working center that converge at a focal center, called the C point, which is established on a base line, it is possible to com-

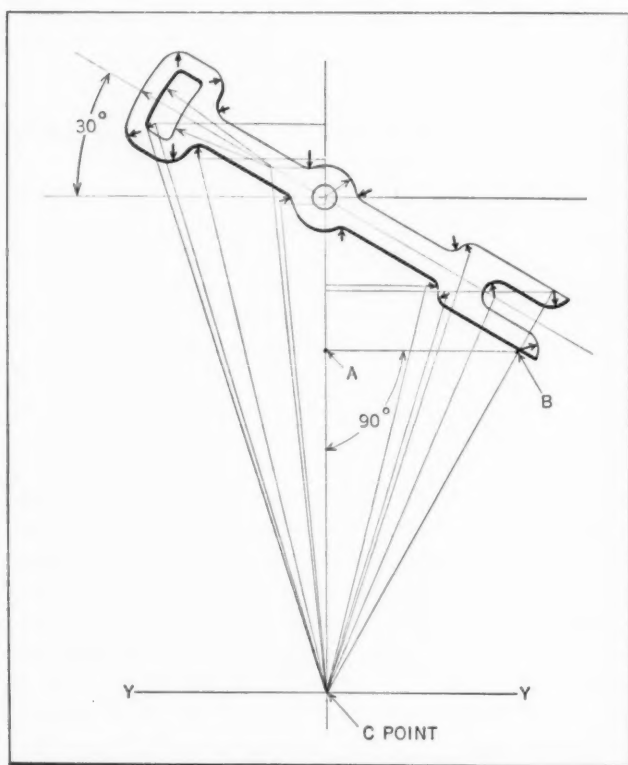


Fig. 3. Detailed Drawing of Part in which All Important Working Points are Located by Radial Lines Drawn from Focal Point C

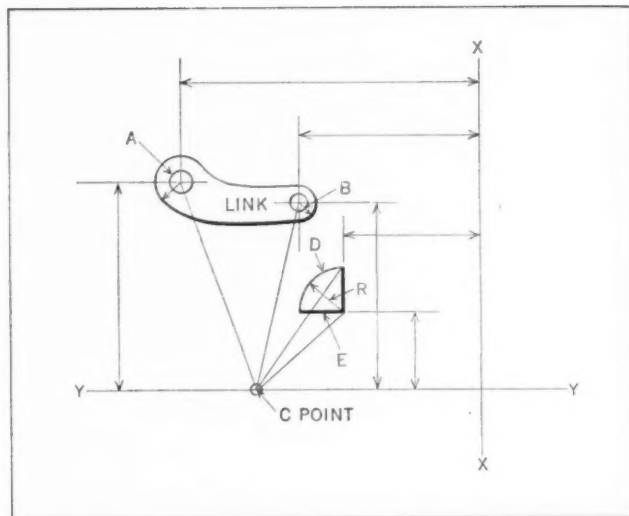


Fig. 4. Application of C-Point Dimensioning to Lay-out for Gage

pute the lengths of the sides of all the right-angle triangles involved, and from these calculations to lay out an accurate master plate for use in making the required blanking punch and die members.

The object in computing these triangular dimensions is to accurately locate each working center by measurements at right angles to each other, taken from the point C. Obviously, if point B in Fig. 3 is positioned by two right-angle movements represented by the lengths of lines CA and AB, then the length of hypotenuse CB serves as an accurate check on the other two dimensions.

Two master plates are necessary, one for the punch and one for the die. A small hole is drilled and bored at the C point center and at each radial center. The master plate for the die contains the internal radial center holes, while the master plate for the punch contains the external center holes, with punch clearances allowed.

After the most economical lay-out of the blank on the stock strip has been determined, the master plates are approximately positioned on the punch- and die-blocks and the C hole transferred to the blocks and a pin inserted. The blocks are now clamped approximately in their correct positions and set up vertically on a surface plate. They are then accurately located by means of a height gage, indicating all distances from the C point. Next, the master plates and blocks are joined by soldering or brazing.

How System Facilitates Accurate Machine Work

The punch- and die-blocks are machined on the faceplate of an accurate bench lathe. A round-nosed pin is inserted at the center of the faceplate. The distance this pin projects from the faceplate must be less than the thickness of the master plate. The master plate, with its work attached, is located on the faceplate by one of the drilled and

bored holes in the master plate itself. The pin at the center of the faceplate, when inserted in one of these holes, locates the work for drilling and boring. The hole is then turned by tools mounted in the tailstock center. This process is repeated until all the holes located by the master plate have been accurately drilled and bored.

Another step in the application of this system is to substitute a focal point *C* for the entire assembly in place of the base lines. Such a procedure insures the fabrication of parts having a high degree of accuracy, as the functions of all the parts or units are controlled by measurements made from one focal center.

Each toolmaker working on any part of the same assembly, or any tool, gage, or fixture used in its production, must necessarily make all his basic measurements from the same point as all the other workmen on the same job.

System Facilitates Gaging of Tools, Parts, and Assemblies

Better means for gaging tools, parts, and assemblies are claimed to be the chief advantage gained by dimensioning from a common point. The making, designating, and storing of master plates for each part and assembly provides an infallible set of accurate gages which can be referred to at any time for checking tools in use or for making new tools to replace old ones. Interchangeability of machined parts is thus maintained throughout many years of tool changes and replacements. These master plates also serve as an accurate reference for the work itself.

The diameters of the holes in the work are, of course, gaged with "Go" and "Not Go" plug gages, which are independent of the *C* holes. When the position of a hole is being gaged, however, the *C* hole is taken into consideration. An example of the *C*-point gaging practice is illustrated in Fig. 4. In this particular mechanism, the link revolves about hole *A* as an axis. The end of the link formed by the radius *B* must clear the radius-formed surface *D* of lug *E* by plus or minus 0.0005 inch. The actual conditions involved are represented by a layout on the face of a plate gage using master plates, each of which contains the *C* hole. One master plate is made for the link, which has a fixed length, while two master plates are made for the lug *E*, one with 0.0005 inch added to radius *R* and one with 0.0005 inch deducted from radius *R*. These two plates thus set the plus and minus limits.

An axis pin for hole *A* is located in two places in the gage for the "Go" and "Not Go" positions. Also, the "Go" and "Not Go" pins are provided for radius *R* relative to the axis pin. The dimensions and positions of all related parts are determined from the *C* hole in the master plates. The layout is made similarly to that illustrated in Fig. 3.

It might seem that the work could be more quickly done on a jig-boring machine without using

master plates or *C* holes. While this may be true in some cases, there are many shops that do not have precision equipment of this kind. Shops using the jig-boring method would not have the master plate standards so essential to the production of parts that are perfectly interchangeable. Of course, one advantage of the method described is its flexibility. If it appears best not to adopt the system for an entire assembly, it can be applied, as the Elgin National Watch Co. uses it, on some particular train of correlated mechanisms or on an important part that must have certain surfaces machined very accurately to size or form.

* * *

The Patent Lawyer as a Business Advisor

By JOSHUA R. H. POTTS

Patent and Trademark Lawyer, Philadelphia, Pa.

Frequently both employers and employees make serious mistakes in handling patent matters because of lack of knowledge of the law relating to their individual rights. For example, an employee who is not employed to make improvements for a specified purpose may suggest or make improvements in the machines, processes, and methods with which he is connected and obtain patents, as his own property, to which his employer has no right.

On the other hand, if the employee introduces the invention into the plant of his employer without any agreement as to his employer's right to use it, then the Courts have held that he has by this act granted his employer an implied shop license which he cannot revoke, even after leaving his employment. Such a license, however, cannot be assigned to someone else without the consent of the inventor.

Then, again, there is the case where a man is employed to design or improve a machine, method, or process. In that case, all inventions made by the employee in connection with that particular work belong to the employer; and if necessary, he may be compelled to convey to his employer all patents taken out by him on inventions made in the process of this work. Briefly, that which he is employed to accomplish becomes, when accomplished, the property of his employer.

Suppose that an inventor who has conceived the general idea or plan of an invention employs a skilled mechanic or chemist to perfect the details of the invention. In that case, the employer who had the original idea is the true inventor, even though the man that he has employed has added patentable features to the original plan.

The rights of employer and employee in patent matters depend so largely upon the exact wording of the contract and on the surrounding circumstances of employment that it would seem advisable to consult an experienced patent lawyer before entering into agreements.

Measuring to Millionths Made Easy

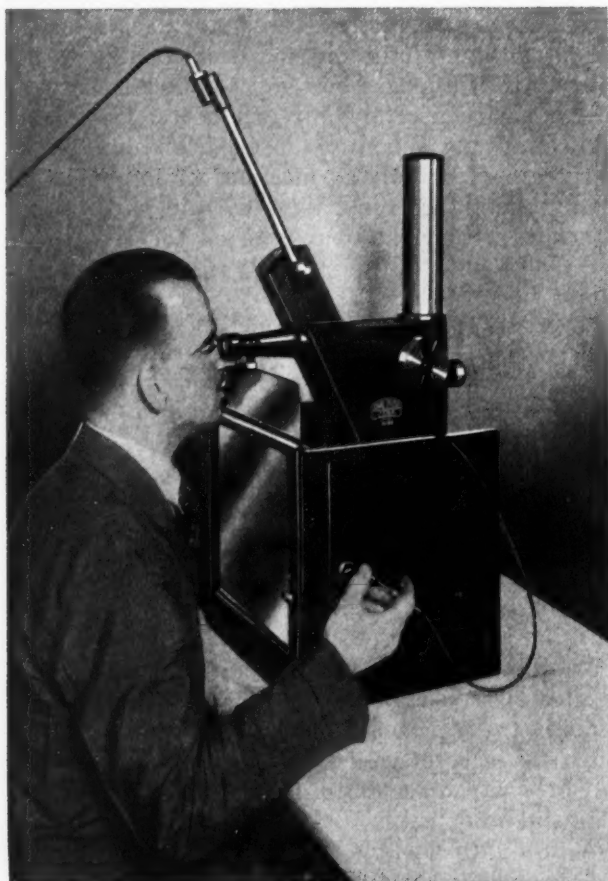


Fig. 1. Determining the Accuracy of Gage-blocks or Other Parts Whose Tolerances are Expressed in Hundred-thousandths or Millionths of an Inch

THE accuracy of the work turned out by any shop depends, of course, upon the accuracy of the gages or other devices used for inspection purposes. The accuracy of the inspection equipment, in turn, depends on the accuracy of the precision standards to which they have been made.

Precision gage-blocks are the standards of accuracy in most metal-working plants engaged in interchangeable manufacture. When new, the gage-blocks produced by one prominent concern are guaranteed to be accurate to within two to eight millionths of an inch, depending on their grade. However, gage-blocks will wear with constant use and unless they are checked periodically, their specified accuracy cannot be depended upon indefinitely. When gages, jigs, fixtures, etc., are made to gage-blocks that are no longer of their prescribed accuracy, it may be possible to assemble together different parts made in the same shop, but difficulties will be experienced in trying to assemble work with parts produced in other shops, or made in the same shop to inspection devices based on another set of gage-blocks.

The Measuring of Gage-Blocks and Other Parts that Must be Accurate within a Few Millionths of an Inch Has Always Been Considered a Laboratory Job—It can Now be Done in the Ordinary Shop with a New Optical Instrument

When the individual shop has wanted to recheck a set of gage-blocks up to the present time, it has been necessary to return the set either to the manufacturer or to send it to the United States Bureau of Standards. The light-wave method has been used exclusively to determine gage-block dimensions. However, the checking of gage-blocks can now be accomplished optically in the plants of users or manufacturers by the use of a Zeiss Ultra-Optimeter, marketed by the George Scherr Co., 130 Lafayette St., New York City.

Graduations on the scale of this instrument which represent 0.00001 inch appear almost 1/8 inch apart, and so it is an easy matter to estimate readings to within two millionths of an inch. The accuracy of such estimates is further assured by the extreme accuracy of the graduations themselves. The fineness of such readings can best be illustrated by pointing out that if the thickness of the average newspaper were split into 3000 parts, the width of one of these infinitesimally narrow parts would be one millionth of an inch. As 1/16 inch is to a mile, one millionth inch is to 1 inch!

The Wide Range of the Ultra-Optimeter

The Ultra-Optimeter is not intended merely for the checking of precision gage-blocks. It is also well adapted to checking thread-gaging wires, round gages, extremely accurate balls, and a large variety of other objects that must be correct to specified dimensions within tolerances of less than 0.0001 inch. The scale of the instrument is graduated a total of 0.00350 inch in both directions from zero, so that measurements within a variation of 0.007 inch can be made. The long scale range has been provided to eliminate the necessity of making up master gage-block combinations to the fourth decimal, which introduces additional sources of error. In this way, the scale adapts the instrument for sorting out gages or precision parts to different classes of tolerances or fits. The optical unit of the instrument may be adjusted on its vertical column to accommodate work up to 10 inches.

This precision measuring instrument is based on the double reflection principle, which has long been

known to scientists but which is not believed to have been previously employed in a commercial instrument. The upper end of the feeler point which rests on the top surface of the object being checked supports one end of a horizontal tilting mirror. With this arrangement, the position of the mirror changes with slight inaccuracies in gage-blocks and other parts which cause the upper end of the feeler point to be in a higher or lower plane.

Graduations from a scale are thrown obliquely by a light on one end of the tilting mirror, are reflected into a second mirror, and then reflected back on the opposite end of the tilting mirror. These graduations are reflected a third time through an objective lens so that they can be observed in the eye-piece of the instrument with respect to a stationary index line. The greater the error in the part being checked, the greater the inclination of the tilting mirror and consequently the greater the distance the zero line of the scale image will appear from the index line of the eye-piece.

In using this instrument, the index line of the eye-piece is lined up with the image of the zero scale graduation when a master gage-block or blocks are placed beneath the feeler point. This is accomplished by merely turning the knurled-head screw seen on the eye-piece in Figs. 1 and 3. The difference between the measurements of the object being checked and the master can then be quickly

determined by observing the amount that the zero scale is displaced from the index line of the eye-piece when the object itself is placed beneath the feeler point. The feeler point is raised for placing objects beneath it by operating a wire cable release.

Preventing Gage-Blocks from being Affected by Heat from the Body of the Inspector

Extremely close inspections, such as those being considered in this article, are generally performed in constant temperature rooms. While this is desirable in the case of the Ultra-Optimeter, it is not absolutely necessary. It is essential, however, to guard the gage-blocks or other objects being checked against heat coming from the body of the inspector. For this reason, a wooden guard such as seen in Fig. 1 is supplied with the instrument. The front side of this guard consists of Robon glass through which light may pass, but not heat.

In the inspection of gage-blocks, use is made of holders, such as seen in Fig. 2, in which can be placed a master block of known precision and the gage-block to be checked. Each holder has four small holes in the bottom flange which may be engaged by prongs on a long handle, as seen in Fig. 3, so as to avoid the necessity of the user's hand being near the gage-blocks. This handle may be operated through a slot in the guard.

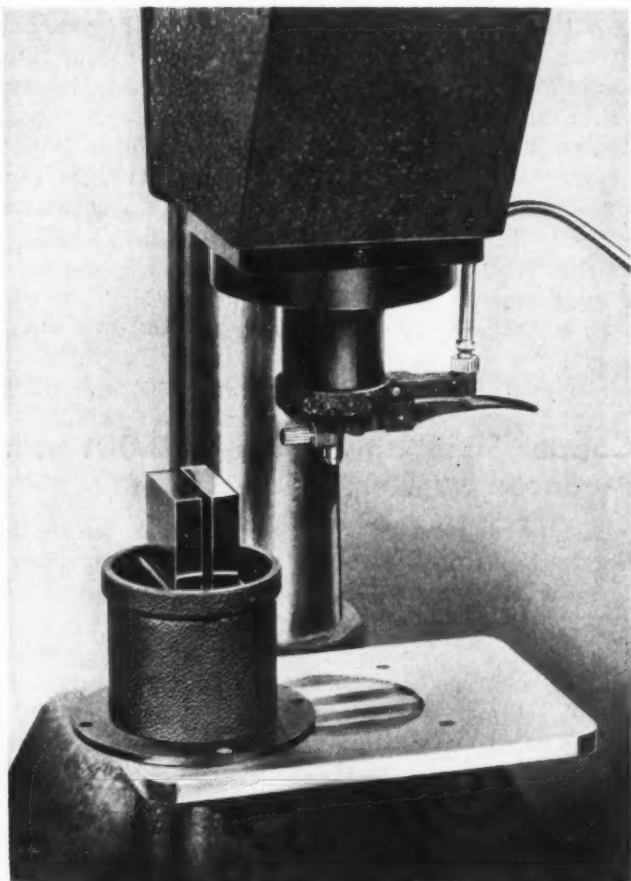
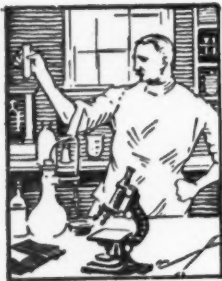


Fig. 2. Holder which Eliminates the Necessity of the Inspector's Hand Touching Gage-blocks



Fig. 3. The Ultra-Optimeter for Checking Gage-blocks and Other Extremely Accurate Parts

MATERIALS OF INDUSTRY



THE PROPERTIES AND NEW APPLICATIONS OF MATERIALS USED IN THE MECHANICAL INDUSTRIES



New Nikrome Steel Suitable for Heavy-Duty Service

Heat-treated nickel-chromium steel bars have been sold for years by Joseph T. Ryerson & Sons, Inc. These bars are intended for heavy-duty parts such as axles, shafts, bolts, studs, and other parts that are subjected to high stresses. To this line of steel there has recently been added Nikrome M, which is recommended for parts from 5 to 8 inches in diameter.

This alloy is made by the Bethlehem Steel Co. and consists of the following analysis: Carbon, 0.35 to 0.45 per cent; manganese, 0.50 to 0.80 per cent; silicon, 0.15 to 0.30 per cent; nickel, 2.00 to 2.50 per cent; chromium, 0.90 to 1.20 per cent; and molybdenum, 0.40 to 0.50 per cent.

Nikrome M can be so heat-treated as to be practically uniform in hardness from the surface to the center, a property that, of course, makes the alloy especially suitable for bars of large diameter. The minimum guaranteed properties for test bars taken from the middle of a section are as follows: Tensile strength, 110,000 pounds per square inch; yield point, 90,000 pounds per square inch; elongation, 16 per cent in 2 inches; and reduction of area, 47 per cent. However, test bars generally exceed those properties by wide margins. The following are typical results: Tensile strength, 125,000 pounds per square inch; yield point, 97,500 pounds per square inch; elongation, 19.5 per cent in 2 inches; and reduction of area, 57.6 per cent.

Stellite Employed for Other Purposes than Cutting Tools

In addition to its application to cutting tools, Stellite is used in the form of welding rod for hard-facing—that is, for obtaining a hard abrasion-resistant coating on surfaces subject to wear. The hard-facing process has developed so rapidly that today literally thousands of parts subjected to wear in practically every industry are thus protected.

Because of its characteristics, Stellite is also used for scores of different products that must re-

sist heat, abrasion, or corrosion, or a combination of these. Thus Stellite is used for such products as bearings, bushings, dental instruments, chemical equipment, cloth and fabric cutting knives, rubber cutting knives, cams, thrust washers, valves and valve seats for automotive and aircraft engines, valves for high-pressure steam and high-temperature gas, oil, air, and acids, parts for manufacturing dry batteries, scale pivots, etc.

A New Babbitt Intended for Heavy Impact Loads

A tin-base babbitt recently added to the products of the Bunting Brass & Bronze Co., Toledo, Ohio, is claimed to possess qualities which make it especially suitable for applications where high speeds, severe vibration, heavy shock, and high impact loads necessitate the use of a metal having a high load-carrying capacity and the ability to withstand elevated temperatures. This "Bunting Genuine," as the babbitt is termed, is cast in 5-pound bars. It supplements the lead-base babbitt which the concern has made for several years.

Copper Sheet as Thin as 0.001 Inch Produced by Electro-Deposition

A new method of obtaining copper sheets by electro-deposition on large metal belts made from a nickel-chromium alloy and then stripping the sheets from the belt has been developed by V. L. Tannehill, of Process Molds, Inc., Fort Wayne, Ind. Sheets as thin as 0.001 inch and up to 20 inches wide have been produced satisfactorily by this method, which involves the use of a new acid plating solution. The special alloy belts travel continuously through the bath, so that the operation is continuous and automatic. The width of the sheet that can be produced is not limited, being governed only by the width of the belt.

The copper sheets produced by this method are unusually smooth and dense and compare favor-

ably with rolled sheets. They can be used for roofing and electrical applications of various sorts, gaskets on automobile engines, decorative panels, etc. Gaskets can be produced with the various holes in them, by employing suitable forms on which the copper is deposited only where desired. This method eliminates the scrap copper that is obtained in blanking gaskets from sheet stock.

One of the important advantages of the special alloy belts is that they remain smooth and bright and do not need periodic polishing. The copper sheets come from the machine ready for use.

Cars of Rust-Resisting Steel for the San Francisco-Oakland Bridge

Sixty two-car articulated units of light-weight construction are being built at the Harlan plant of the Bethlehem Steel Co. for operation on the long bridge that is being constructed between San Francisco and Oakland. These units are each 110 feet long and will seat 124 passengers. The car bodies will be made of Mayari R, which is a corrosion-resisting steel of high tensile strength. Each car will be equipped with a forced heating and ventilating system having a capacity for providing up to 4000 cubic feet of air a minute. The two-car units can be operated single or with as many as seven units, or fourteen cars, connected.

Cements Containing Thiokol Available for Various Industrial Uses

Sulphur cements discovered through the research activities of a multiple fellowship sponsored by the Texas Gulf Sulphur Co. at the Mellon Institute of Industrial Research are now being manufactured by the Atlas Mineral Products Co., Mertztown, Pa. One of these cements, designated "TeGul-Vitro-bond," has been used successfully in the construction of acid-proof masonry linings for rubber-lined, steel, and concrete tanks, as well as in the construction of all-masonry equipment. Some of the advantages claimed include unusual bonding strength and high resistance to vibration, mechanical shock,

and sudden changes in temperature. These advantages are gained without sacrificing structural strength or acid resistance.

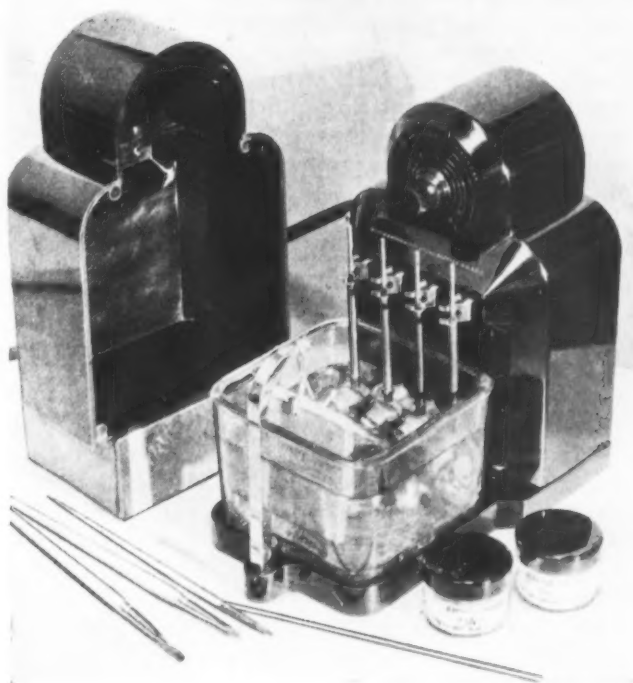
Another cement, known as "TeGul-Tileset," is compounded especially for the construction of acid-proof concrete and tile floors in dairies, food and condiment plants, and other industrial buildings where acid deterioration presents a problem. This cement is supplied in a molten state and allowed to solidify in the joints. It gives an acid-tight joint, so that leakage through floors is prevented. This feature suggests the use of this cement in the construction of indoor swimming pools, floors under showers, etc.

A third cement, known as "TeGul-Mineralead," is made especially for bell and spigot joints in cast-iron or terra-cotta pipe. It is claimed that such joints are readily made and are permanently leak-proof. They also resist vibration and high temperatures.

Palladium Resists Tarnishing under Humid Conditions

The metal palladium, which can be purchased in extremely thin leaf form, has remarkable resistance to tarnishing under humid conditions. For this reason, it is now being used for signs inside of the huge refrigerators employed in the meat-packing industry. In these rooms, where temperatures run between 38 and 42 degrees F., the humid conditions tarnish most metallic leaf, except, of course, that made from precious metals. After fifteen months of service, however, it has been found that palladium leaf holds its bright platinum color without the slightest discoloration.

*A Plating Machine
Used by Dentists,
Built by the Hanau
Engineering Co., Buf-
falo, N. Y. The Hous-
ing and Cover are
Molded from Durez
in a Lustrous Black*





Steel

JOSEPH T. RYERSON & SON, INC., 16th and Rockwell Sts., Chicago, Ill. General data book containing 192 pages, 4 1/2 by 8 1/2 inches, covering tool and alloy steels. The booklet contains considerable technical information, such as choosing the right steel for the job; heat-treatment of steel; forging; drawing; casehardening; etc. It also presents 34 pages of charts, showing the average physical properties of heat-treated steel. Tables of SAE standard specifications for different types of steels, and estimated weights of steel bands and hoops, as well as of bars and plates, are included, in addition to much other information of value to the steel user.

Screw-Cutting Lathes

SOUTH BEND LATHE WORKS, 725 E. Madison St., South Bend, Ind. Bulletin 36A, entitled "How to Cut Screw Threads in the Lathe," containing a step-by-step description of the cutting of threads in a lathe, and giving tables of standard screw thread pitches and recommended tap drill sizes. Definitions of various terms relating to screw threads are included, and several pages are devoted to arrangements of gearing. Space is also given to metric screw threads, the use of taps and dies, formulas for standard screw thread forms, etc. A nominal charge of 10 cents a copy is made to cover cost of handling and postage.

Precision Grinding Machines

EX-CELL-O AIRCRAFT & TOOL CORPORATION, 1200 Oakman Blvd., Detroit, Mich. Leaflets illustrating and briefly describing three styles of Ex-Cell-O carbide tool grinders—the No. 44 machine equipped with diamond wheels for high finish, accurate, and fast grinding of carbide-tipped boring, turning, and facing tools; the No. 46 machine for use with vitrified cup-wheels, diamond wheels, and lapping disks; and the No. 48 machine for peripheral and face grinding on vitrified straight wheels and cup-wheels.

**Recent Publications on
Machine Shop Equipment,
Unit Parts, and Materials.
Copies can be Obtained
by Writing Directly to
the Manufacturer.**

Electric Pyrometers

LEEDS & NORTHRUP CO., 4934 Stenton Ave., Philadelphia, Pa. Catalogue N-33A, illustrating and describing the complete line of Micro-max thermo-couple pyrometers. The catalogue explains the potentiometer method of measurement, and describes among other types the new "Silver Anniversary" Model S Micro-max, which can be equipped to operate signals and automatic controls, and is available not only for temperature measurements, but for many other kinds of measurements as well.

Hollow Screws

ALLEN MFG. CO., Hartford, Conn. Catalogue entitled "Allen Hollow Screws," containing information and tabulated matter pertaining to the various types of screws made by the company, including hollow set-screws, socket-head cap-screws, socket-head shoulder-screws, and special screws. Screwdriver style wrenches, ratchet wrenches, normalized hexagon wrenches, T-handle wrenches, pipe plugs, and tap extensions are included. A special section is devoted to thread information.

Metal-Cutting Band Saws

HENRY DISSTON & SONS, INC., 806 Tacony, Philadelphia, Pa. Booklet entitled "Disston Metal-Cutting Band Saws—Their Selection and Care," describing the design and characteristics of metal-cutting band saws and giving information relating to their use. Tables indicating length and width of standard blades, and com-

parative information relating to the use of circular saws, band saws, and hacksaws are included.

Titanium-Carbide Alloys

AMERICAN CUTTING ALLOYS, INC., 347 Madison Ave., New York City. Booklet containing data on "Cutanit," a titanium-carbide metal especially adapted for machining steel. The booklet contains information on the making of a "Cutanit" tool, proper grinding procedure, and instructions for using. It also gives clearance, rake, and speeds to be used in machining various classes of metals, rubber, plastics, etc.

Oils and Leathers

E. F. HOUGHTON & Co., 240 W. Somerset St., Philadelphia, Pa., is distributing a new publication entitled "Research, Illustrated," which will contain discussions of technical problems from a research viewpoint, illustrated with photographs and photomicrographs. The first edition was devoted to textile processes. Subsequent numbers will deal with transmission, lubrication, and metalworking.

Power Transmitting Equipment

LINK-BELT CO., 519 N. Holmes Ave., Indianapolis, Ind. Book No. 1557 containing tables giving dimensions and prices of the many cut-tooth sprocket wheels now available with Silverlink finished-steel roller chains. Information is given on the selection of roller chain drives to meet usual requirements, and tables of horsepower ratings for different sizes of roller chains are included.

Gear Testing Machines

FELLOWS GEAR SHAPER CO., 78 River St., Springfield, Vt. Circular illustrating and describing the Fellows 8M and 3M "Red Liners" for inspecting gears and hourglass steering worms. The circular describes the operation of these machines in detail, and shows examples of the charts on which a visual record is made of any inaccuracies in the gears being tested.

Metal Polishing

NORTON Co., Worcester, Mass. Booklet entitled, "Facts About Metal Polishing," containing a wealth of information on the subject of polishing and polishing wheels, including abrasive grain for polishing, preparation of glue, types of polishing wheels, setting up polishing wheels, setting up abrasive belts, and the polishing of different metals.

Chain Drives

RAMSEY CHAIN Co., INC., 1039 Broadway, Albany, N. Y. Catalogue No. 636, containing much useful information on chain and sprocket drives in general, with specific application to the use of Ramsey silent chain drives for efficient and economical power transmission. This book is as much of a concise reference book as it is a catalogue.

Air Compressors

WORTHINGTON PUMP & MACHINERY CORPORATION, Harrison, N. J. Bulletins L-611-B11, L-611-B12, and L-620-B16, describing, respectively, Worthington single-tandem horizontal two-stage steam- and motor-driven compressors; single horizontal three-stage steam- and motor-driven compressors; and vertical two-stage compressors.

Arc-Welding Machines

LINCOLN ELECTRIC Co., Cleveland, Ohio. Catalogue entitled "Lower-Cost Manufacturing by Shielded Arc Welding," outlining the advantages of the shielded arc welding process, and showing typical examples of various parts that have been made by this process at considerable savings, specific data being given.

Portable Electric Tools

CHICAGO PNEUMATIC TOOL Co., 6 E. 44th St., New York City. Catalogue cut out to the form and size of the "Midget" universal electric drill made by this company. This unique little booklet contains information on the construction of the "Midget" drill, as well as complete specifications.

Cleaning Chemicals

MAGNUS CHEMICAL Co., 22 South Ave., Garwood, N. J. Circular describing the properties and uses of Magnusol, a chemical cleaner that is specially suitable for removing dirt, grease, and oil from machinery of

various types, and is also applicable to a wide range of industrial cleaning purposes.

Packing

CRANE PACKING Co., 1800 Cuyler Ave., Chicago, Ill. Bulletin illustrating and describing the "Super-Seal" dry-graphite-lubricated plastic packing made in various grades suitable for air, water, steam, ammonia, chemicals, oils, petroleum distillates, foods, fruit juices, caustic alkali, acids, etc.

Milling Machine Accessories

WELDON TOOL Co., 321 Frankfort Ave., Cleveland, Ohio. Bulletin entitled "Holders for End-Mills and Shell End-Mills," illustrating and describing the company's line of holders and adapters for end-mills, made in all standard tapers—Brown & Sharpe, Morse, and milling machine standard.

Blast-Cleaning Equipment

PANGBORN CORPORATION, Hagerstown, Md. Catalogue covering dust collectors, airless Rotoblaster, blast machines and separators, blast rooms, blast barrels, blast tables and casting washers, blast cabinets, and accessories. The catalogue is provided with a quick-reference thumb-index.

Light Wave Measuring Equipment

VAN KEUREN Co., 12 Copeland St., Watertown, Boston, Mass. Circular M21, describing the Van Keuren new and improved light wave measuring equipment for checking precision gage-blocks and measuring machines, as well as precision lapped parts.

Industrial Weighing Equipment

EXACT WEIGHT SCALE Co., Columbus, Ohio. Booklet entitled "Industry at Work," dealing with industrial weighing and packaging problems in a broad field of manufacturing activities. The booklet is profusely illustrated, and information is given in concise captions.

Vise Fixtures

R. G. HASKINS Co., 4636 W. Fulton St., Chicago, Ill. Bulletin illustrating and describing the Haskins No. 602 vise fixture, which has been developed to meet the requirements of many tapping operations for clamping the pieces being tapped.

Cold-Drawn Steel

UNION DRAWN STEEL Co., Massillon, Ohio. Circular entitled "Union Cold Drawing Often Eliminates Costly Production Methods," illustrating a variety of cold-drawn special shapes which are lowering the cost of producing steel parts.

Wire Straightening and Cutting Machines

LEWIS MACHINE Co., 1592 E. 24th St., Cleveland, Ohio. Bulletin 536, describing the principle of operation and mechanical features of the Lewis "Travel Cut" automatic wire straightening and cutting machine.

Tools

MICHIGAN TOOL Co., 7171 E. McNichols Road, Detroit, Mich., is publishing a monthly bulletin known as *Production Highlights*, which is devoted to the announcement of new products made by this concern and new uses for these products.

Washers

WROUGHT WASHER MFG. Co., 2100 S. Bay St., Milwaukee, Wis. Stock list No. 55-A of standard and special washers, listing thousands of types in various materials, including steel, brass, copper, aluminum, and fiber.

Motors

RELIANCE ELECTRIC & ENGINEERING Co., Ivanhoe Road, Cleveland, Ohio. Bulletins 213 and 214, illustrating and describing Reliance Type T fully enclosed, fan-cooled, heavy-duty motors for direct current.

Riveting Machines

HANNA ENGINEERING WORKS, 1765 Elston Ave., Chicago, Ill. Circular entitled "\$1000 Saved in Seven Months with This Hanna Differential Riveter," giving the details of actual savings made through the use of this machine.

Electric Control Devices

WARD LEONARD ELECTRIC Co., Mount Vernon, N. Y. Catalogue of industrial control devices, covering field rheostats, manual starters and regulators, automatic starters, contactors, and automatic transfer switches.

Electric Furnaces

FIRTH-STERLING STEEL Co., McKeesport, Pa. Circular illustrating

and describing the special features of the Firth Braze-Rite electrically operated furnace, developed principally for brazing sintered carbide cutting tools.

Indicating and Controlling Instruments

C. J. TAGLIABUE MFG. CO., Park and Nostrand Aves., Brooklyn, N. Y. Circular illustrating various types of Tag indicating controllers and pyrometers.

Wrenches, Chisels, Hammers, etc.

BONNEY FORGE & TOOL WORKS, Allentown, Pa. Catalogue 136, listing the complete line of wrenches, sockets, chisels, hammers, punches, and screwdrivers made by this concern.

Ball Bearings

AHLBERG BEARING CO., 317 E. 29th St., Chicago, Ill. Loose-leaf catalogue with complete engineering specifications on the new CJB pillow block, as well as complete data on the company's line of ball bearings.

X-Ray and Radium Inspection

ST. JOHN X-RAY SERVICE, INC., 30-20 Thomson Ave., Long Island City, N. Y. Circular containing a list of ninety-two elements together with their atomic weights, melting points, and other properties.

Spray Nozzles

WORTHINGTON PUMP & MACHINERY CORPORATION, Harrison, N. J. Bulletin illustrating and describing spray nozzles for steel mills for descaling service in the manufacture of strip, plate, and bar steel.

Portable Pipe and Bolt Machines

BEAVER PIPE TOOLS, INC., Warren, Ohio. Bulletin covering the Beaver Model A special and standard pipe machines. Complete specifications are given, including prices.

Automotive Service Equipment

J. D. COCHIN MFG. CO., South San Francisco, Calif. Catalogue covering the automotive service equipment manufactured by this company, including air compressors, control valves, hydraulic lifts, etc.

Electric Counters

PRODUCTION INSTRUMENT CO., 1321 S. Wabash Ave., Chicago, Ill. Bulletin

16, describing the construction of the Type EC electric high-speed counters which are applicable to a wide range of operations.

Hydraulic Presses

BALDWIN - SOUTHWARK CORPORATION, Philadelphia, Pa. Bulletins 126 and 127, descriptive of Southwark general utility hydraulic presses and Southwark "Hyspeed" hydraulic presses, respectively.

Speed Reducers

ABART GEAR & MACHINE CO., 4834 W. 16th St., Chicago, Ill. Bulletin 1200, containing tables of horsepower rating covering Abart straight-line drive, spur-gear speed reducers in ratios up to 20 to 1.

Power Presses

NIAGARA MACHINE & TOOL WORKS, 637-697 Northland Ave., Buffalo, N. Y. Bulletin 59-C, illustrating and describing the Niagara No. 101 bench type power press, giving complete specifications.

Electric Welding

LINCOLN ELECTRIC CO., Cleveland, Ohio. Booklet entitled "Lower Piping Costs with Shielded Arc Welding," illustrating and describing the application of electric welding to piping installations.

Blueprinting Equipment

PARAGON-REVOLUTE CORPORATION, 77 South Ave., Rochester, N. Y. Catalogue illustrating and describing various types of electric blueprinting machines and equipment made by this concern.

Indicating and Controlling Instruments

BROWN INSTRUMENT CO., Philadelphia, Pa. Circular illustrating and briefly describing the features of Brown air-operated controllers, which are applicable to a wide range of processes.

Speed Reducers

FALK CORPORATION, Milwaukee, Wis. Bulletins 1100 and 2100, describing in detail parallel-shaft speed reducers and right-angle speed reducers, respectively.

Carburizing

AMERICAN GAS FURNACE CO., Elizabeth, N. J. Folder entitled "Continuous Carburizing of Screws with City Gas," giving a complete description of the process.

Portable Power Units

BLACKHAWK MFG. CO., Milwaukee, Wis. Circular 268, illustrating and describing new additions to the Porto-Power line of tools for automotive service.

Drilling Machines

AVEY DRILLING MACHINE CO., Cincinnati, Ohio. Circular illustrating and giving specifications of Avey Type MA-8 machines with eight spindle speeds.

Metal-Cleaning Equipment

DETROIT REX PRODUCTS CO., 13003 Hillview Ave., Detroit, Mich. Circulars 116 and 117, containing data on Detrex degreasers and Triad cleaners, respectively.

Polishing Wheels

GENERAL ABRASIVE CO., Niagara Falls, N. Y. Wall chart, 11 by 14 inches, containing complete directions for setting up polishing wheels.

Vibration Dampeners

KORFUND CO., 48-15—32nd Place, Long Island City, N. Y. Bulletin No. 53-C, entitled "Vibration Isolation by Means of Steel Springs."

Centrifugal Pumps

ALLIS-CHALMERS MFG. CO., Milwaukee, Wis. Leaflet 2224, on Allis-Chalmers single-suction end inlet centrifugal pumps.

Metal Stampings

DAYTON ROGERS MFG. CO., Minneapolis, Minn. Folder entitled "Custom-Made Metal-Stamped Signs and Letters."

Overhead Cranes

WHITING CORPORATION, Harvey, Ill. Bulletin No. 300, covering electric overhead traveling cranes.

* * *

Norma-Hoffmann Announces Improvements

The Norma-Hoffmann Bearings Corporation, Stamford, Conn., now packs all its wholly enclosed sealed precision bearings with a grease, pretested for maximum stability. In addition, as a precaution against the effects of grease oxidation, the bearings are wrapped in aluminum foil. This method of testing greases and packaging bearings was determined upon after a long investigation by the company's research department.

Shop Equipment News

Machine Tools, Unit Mechanisms, Machine Parts, and Material-Handling Appliances Recently Placed on the Market

Jones & Lamson Automatic Thread Grinding Machine

An automatic thread grinding machine designed around the truing device as the primary element is being introduced on the market by the Jones & Lamson Machine Co., Springfield, Vt. The grinding wheel of this machine is kept sharp continuously throughout its effective life without any attention from the operator and without disturbing the size adjustment to which the wheel is set. As a result, it is claimed metal is removed by a true cutting action in the form of microscopic chips instead of dust. In addition, metal can be removed fast without burning the work, so that heavy cuts may be taken without sacrificing accuracy.

This machine is fully automatic except for loading the work and taking it out, and for withdrawing the grinding wheel at the end of the cut. When the correct thread size is reached, the grinding wheel feed stops automatically. The machine also compensates automatically after each truing for the decrease in the size of the grinding wheel.

The standard machine is designed to grind threads up to and including 8 inches in diameter and thread lengths up to 9 inches. This length of thread may be ground at any point on work up to 24 inches long. The standard machine is made to swing work up to 11 1/2 inches in diameter and up to 31 inches long between centers. The machine spindle is bored to permit the grinding of threads up to 1 5/8 inches in diameter on long shafts or similar parts held in a

chuck. Single, double, triple, quadruple, or sextuple threads can be ground either from the solid or from previously rough-cut threads.

A rheostat graduated to correspond with graduations on the wheel-truing device provides for maintaining the desired peripheral speed of the wheel as it decreases in size. The wheel-spindle and its motor are mounted in a cradle which permits tilting the wheel at any angle up to 15 degrees in either direction to correspond with the angle of the thread being ground. This wheel-head unit operates on anti-friction roller bearings which, in turn, operate on hardened and ground rails.

One of the important features of the machine is a taper grind-

ing attachment in which a hardened steel former is merely inserted for reproducing any desired taper on the work. No compensation for lead is necessary whether the thread is of simple taper, both straight and tapered, or of double taper.

A single-lever work-speed selector equipped with a direct-reading dial facilitates choosing the proper work speed, there being a range of eighteen forward and reverse speeds for grinding in either direction. When the operation consists of grinding in one direction only, speeds from 75 to 100 revolutions per minute are available for the rapid return movement.

A standard attachment is furnished for grinding circular chasers, button type thread



Jones & Lamson Thread Grinding Machine on which the Wheel is Automatically Trued and Positioned for Grinding to the Desired Diameter

hobs, or straight and tapered thread hobs without lead and with either straight or helical flutes. This device feeds the wheel to depth, backs it out of the cut, advances the work an amount equal to the thread pitch, and again feeds the wheel to depth. This cycle is repeated automatically until the opera-

tion is completed. There is also an attachment for providing any desired relief on taps and hobs, and a third attachment which automatically speeds up the machine while the grinding wheel is passing over flutes. The truing device is operated under hydrostatic pressure to exclude grit.

Pratt & Whitney High-Speed Vertical Miller and Profiler

Spindle speeds from 300 to 3600 revolutions per minute are provided on a No. 12B vertical miller and profiler that is being announced to the trade by the Pratt & Whitney Division of the Niles-Bement-Pond Co., Hartford, Conn. This range of speeds adapts the machine for the efficient cutting of practically every metal. When the machine is supplied for general-purpose applications, the spindles are driven individually by four-speed mo-

tors and interchangeable motor and spindle pulleys. With this arrangement there are eight spindle speeds available within the range mentioned. When the machine is intended for single-purpose applications, it is equipped with constant-speed individual motors and step pulleys that provide four spindle speeds.

This new machine, as may be seen from the illustrations, is similar in general appearance to previous Pratt & Whitney pro-

filers in that the spindles travel longitudinally on cross-slides which operate on a cross-rail, while the table travels transversely between two columns. The motor for each spindle is mounted vertically on a hinged bracket at the rear of the machine, as shown in Fig. 2, and drives the spindle through multiple V-belts. The motor brackets swing freely on ball bearings. The desired belt tension in each drive is maintained through a radius-rod and turnbuckle.

The spindles have a vertical travel of 4 1/2 inches in their slides, the minimum distance from the top of the table to the bottom end of each spindle being 3 1/2 inches and the maximum distance, 8 inches. The spindle slides are traversed vertically by operating long levers. Each spindle is mounted in two preloaded ball bearings at the bottom and a single floating ball bearing at the top. A built-in spring counterbalances the

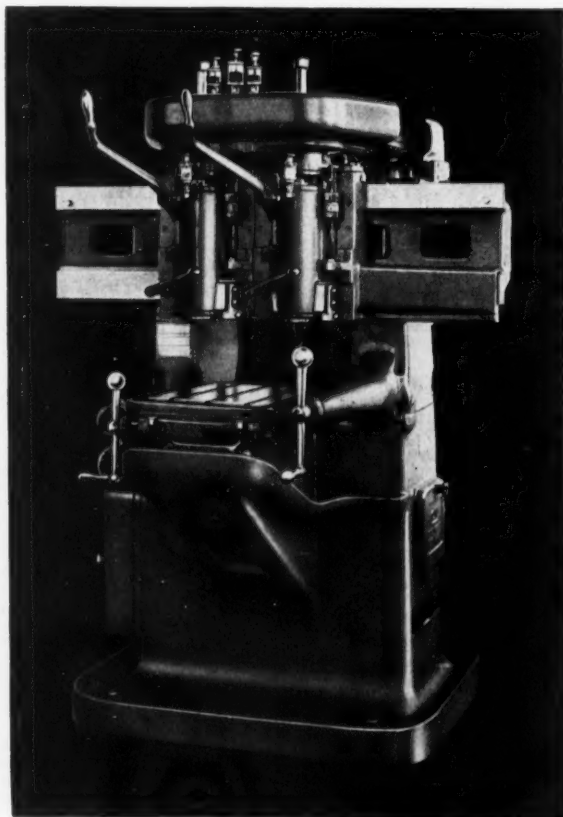


Fig. 1. Pratt & Whitney High-speed Vertical Milling and Profiling Machine

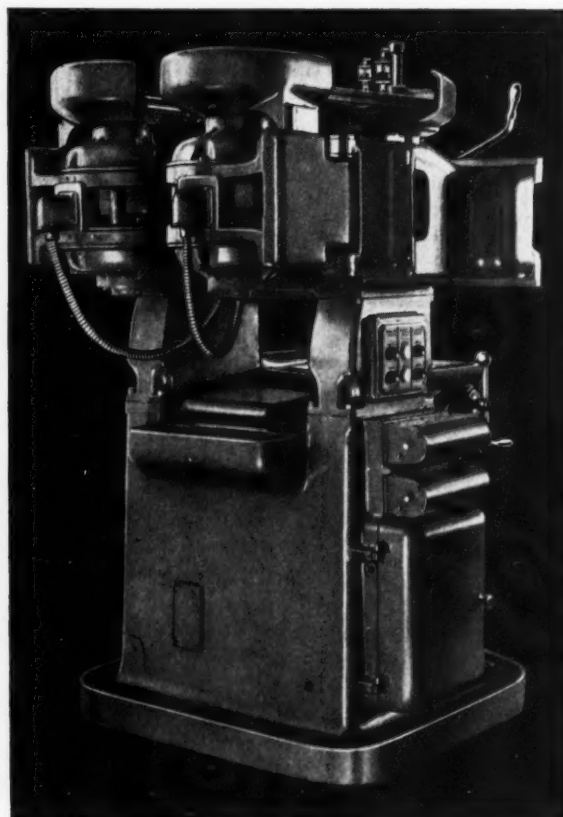


Fig. 2. The Individual Spindle Motors are Mounted on Hinged Brackets at the Rear

SHOP EQUIPMENT SECTION

weight of each spindle and its slide.

Cutters are held in the spindles by draw-bars operated from the top of the machine. By turning these draw-bars in the opposite direction to locking, they also serve as positive knock-outs for the cutters. This design eliminates the need of driving the cutters from the spindles with a lead hammer.

The cross-slides are provided with weight compensating rolls which make the feed unusually sensitive and easy to operate. Stops equipped with dials graduated in thousandths of an inch insure accuracy of operations. There is a horizontal lever in front of each spindle for locking the slide in any desired position. Both the table and the cross-slides are operated by levers through rack and pinion drives.

All electrical control apparatus is located in a compartment in the bed which is accessible through a hinged cover. Individual controls are furnished for the four-speed motors, and push-buttons for starting and stopping are mounted on the left-hand column. The working surface of the table measures 14 by 18 inches and the table has a travel of 20 inches. Special equipment consisting of an adjustable cross-slide and table stops, raising blocks for increasing the machine capacity, a complete range of cutters, and pump equipment is available.

Field-Discharge Switch for Motors and Generators

A manually operated discharge switch for motor and generator field circuits, designed to be mounted back of

the switchboard, is a new product of the General Electric Co., Schenectady, N. Y. This new switch, known as "Type LF-23," has a rating of 250 volts direct current, 100 and 200 amperes only.

It is of the double-pole, single-throw type. The double-throw switches are made up of two single-throw switches with mechanical interlocking devices designed to prevent closing both throws at one time.

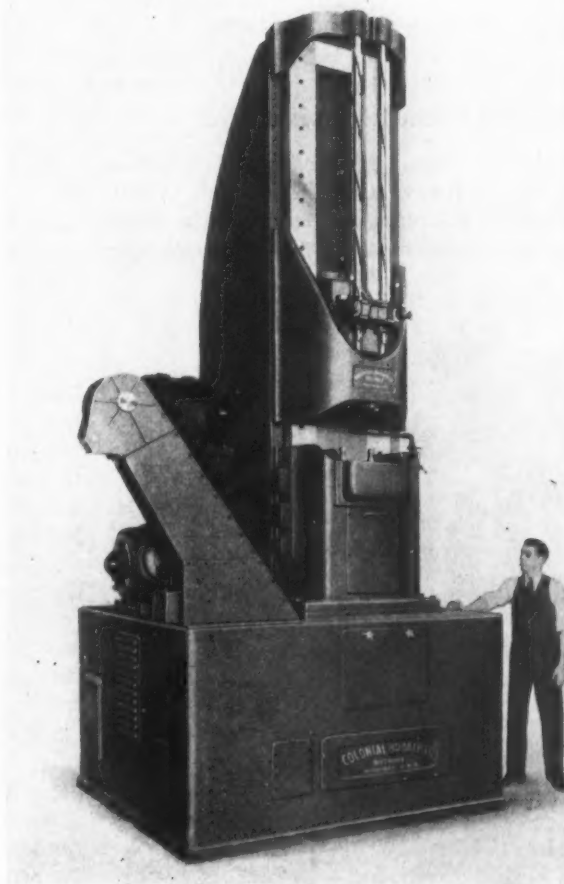
Huge Colonial Broaching Machine

A vertical broaching machine that measures 16 feet from the base to the top was recently installed by the Buick Motor Co. for broaching spiral splines in gears. This machine is believed to be the largest vertical broaching machine ever built. Running at 85 per cent capacity, it will produce 180 gears an hour, broaching finished splines from a rough-punched hole. Two gears are broached simultaneously on this machine.

In order that the work could be handled conveniently and so that there would be ceiling clearance, it was necessary to install the machine in a pit four feet deep. The size of the gears broached and the amount of stock removed necessitated provision for thirty tons of pressure on the ram. This high power is obtained by coupling 40- and 20-horsepower motors to a combination of hydraulic pumps, which are capable of producing a cutting speed of 30 feet a minute at the pressure mentioned. The ram of the machine has a stroke of 5 feet.

This giant broaching press was built by the Colonial Broach Co., 147 Jos. Campau Ave., Detroit, Mich. Although of special design, it follows the general principles of conventional vertical surface broaching machines. It is fully automatic. The broaches are handled by hydraulic cylinders and the spiral feed is obtained through the use of spiral driving bars which are connected through a gear-box to broach pulleys. These pulleys can be disengaged from the driving bars for straight broaching operations.

As the machine produces an unusually large volume of chips, a conveyor has been provided under the floor for carrying the chips to a point outside the shop.

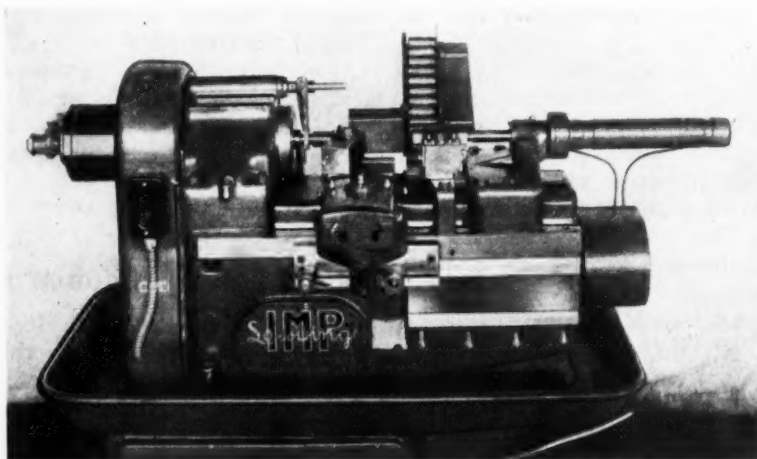


Giant Broaching Machine which is Believed to be the Largest Ever Built

Seneca Falls Lathe Equipped with Automatic Work-Handling Device

Automatic safety work-handling devices have recently been applied to the Lo-Swing Imp lathes made by the Seneca Falls Machine Co., Seneca Falls, N. Y. The small high-speed automatic lathe illustrated is designed for handling bushings, pistons, valves, bearings, and other similar turning jobs. The particular machine shown is one of several now in use on a bronze bushing job.

In operation, the work is fed automatically from the chute to the work-holding arbor for machining. After machining, the tool withdraws and automatically returns to the starting point while the finished work is stripped from the arbor and discharged into a work box. The next piece is then automatically loaded into the arbor. Both the



Seneca Falls Lathe Equipped with Automatic
Work-handling Device

machine and automatic loading device operate on a fast continuous cycle. The equipment shown increased production and reduced the cost of operation 75 per cent. An important feature of this equipment is the reduction of accident hazards.

chine described in October, 1935, *MACHINERY*, page 151, and it is identical in appearance except for two heads and carriages. Speed changes are accomplished by operating levers at the front of a self-contained gear-box, an index-plate showing the lever positions for different speeds.

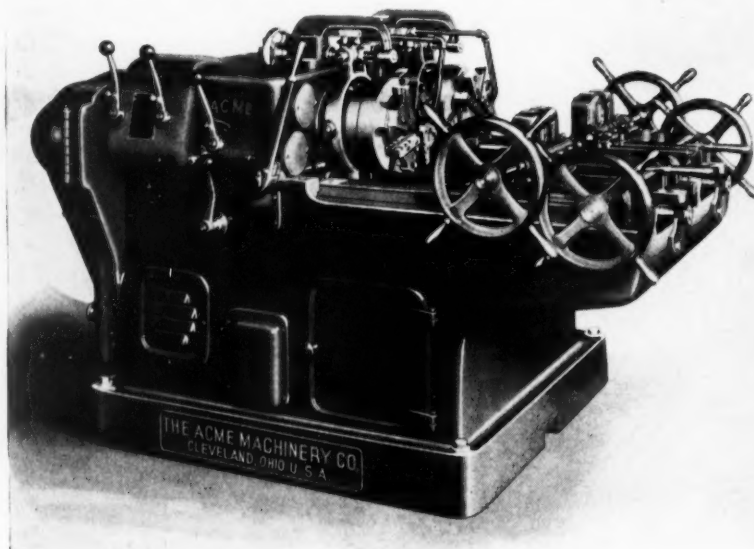
Tangent die-heads which consist merely of a die ring and barrel are furnished. The die-block, which is a hardened and ground steel forging, operates in long tool-steel bushings in the die ring and between hardened and ground plates in the die barrel, a construction which insures long life and accurate die alignment. The die is adjustable in the die-block by means of a screw. Bearing surfaces on three sides of the die insure rigidity during threading operations. Uniform adjustment of all four dies in a head is accomplished by means of a handwheel without stopping the machine.

For cutting threads accurate as to lead and for cutting threads of coarse pitch, a lead-screw drive for the carriage is recommended by the manufacturer. The lead-screw is located directly on the center line of the spindle so as to eliminate any tendency to bind the carriage on its ways. A tubular cover prevents dirt and chips from dropping on the lead-screw. A pitch indicator is furnished.

Acme Double-Head Threading Machine

Two pieces of work can be threaded simultaneously on a double-head Model 35 threading machine now being introduced

to the trade by the Acme Machinery Co., Cleveland, Ohio. This machine embodies the same features as the single-head ma-



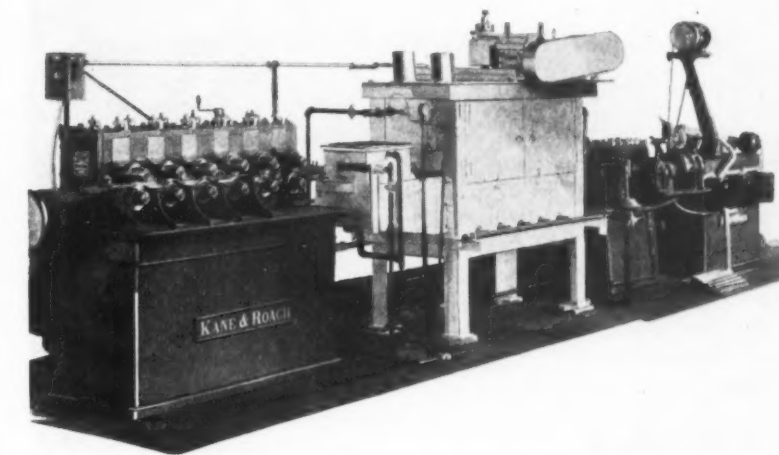
Acme High-production Threading Machine Equipped with
Two Heads and Carriages

SHOP EQUIPMENT SECTION

Kane & Roach Machines for Producing Radiator Tubes

Rectangular lock-seam radiator tubes 0.531 inch high by 0.093 inch wide are produced from brass strip stock 0.0075 inch thick at the rate of 110 lineal feet per minute on equipment recently brought out by Kane & Roach, Inc., Syracuse, N. Y. A tube of the same outside dimensions but rolled from 0.0095 inch stock, and a round lock-seam overflow tube having an outside diameter of 0.315 inch rolled from brass strip 0.015 inch thick are also produced with this equipment, which consists of a cold-roll forming machine, a tinning machine, a straightening machine, and a rotary cut-off. As shown in the illustration, these machines are arranged end to end, so the stock can pass uninterruptedly from one machine to the other.

When this equipment is in operation, the tube passes from the forming machine through the tinning machine, where it is coated with solder to a depth of 0.001 to 0.00125 inch, after which



Kane & Roach Cold-roll Forming Machine, Tinning Machine, Straightening Machine, and Rotary Cut-off

it passes through the power straightening unit, and from there into the rotary cut-off, where the rectangular tubes are cut to lengths of 20 7/8 inches. The tinning machine is equipped with automatic thermostatic control and the electric equipment is wired in series so that should any motor become overloaded or be cut off for any reason, the entire electrical equipment would be automatically shut off.

N. Y. This machine can "cut down," color-buff, or satin-finish either ferrous or non-ferrous sheets. Due to a positive control of the buffing pressure and the time of contact with the work, it is claimed that a finer finish is obtainable than with hand buffing methods.

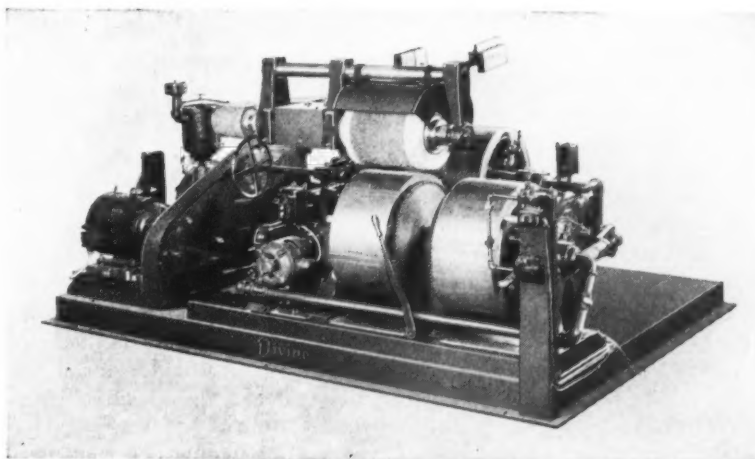
The sheet to be buffed is placed on a revolving drum which brings it into contact with the buffing wheel. Sheets may be held on this drum either by vacuum or magnetically. Two drums, which are shifted into and out of the buffing position by means of an air cylinder, permit the loading of a sheet while another is being buffed, thereby enabling continuous production to be maintained.

Buffing wheels 18 inches in diameter by 18 inches in face width are used. The buffing spindle is provided with an oscillating mechanism that eliminates streaks on the work. The oscillator can be readily disengaged when not required. The wheel-spindle is mounted in roller bearings and is driven by a 20-horsepower motor. A variable-speed V-belt drive permits a 50 per cent variation in the wheel speed, so that buffs can be used at their maximum efficiency even when worn down. An air cylinder provides for quick lifting of the buffing wheel from the work at the end of an operation.

Divine Bros. Sheet Buffing Machine

Sheets of any size up to 16 inches wide by 7 feet long and up to 0.020 inch in thickness can

be handled by a buffing machine recently built by the Divine Bros. Co., 102 Whitesboro St., Utica,



Machine Built by Divine Bros. Co. for Automatically Buffing Ferrous or Non-ferrous Sheets

Oilgear Press for Assembling Valve Guide Bushings in Cylinders

Accurate assembly of valve guide bushings to a predetermined depth and at a known press fit can be accomplished on a high-production basis with a 5-ton two-column "Pushemall" press manufactured by the Oilgear Co., 1310 W. Bruce St., Milwaukee, Wis. Four valve guide bushings are simultaneously pressed into two air-cooled gasoline-engine cylinders at each stroke of this press. The operator loads the two cylinders in the lower part of the fixture and then inserts the valve guide bushings in hardened steel bushings in the top of the fixture. The control lever is next moved forward to start the assembling operation. The first half of the press stroke raises disappearing pins which locate the cylinders, while the second half of the stroke actuates a control valve which causes the cross-head to move downward and press the four guide bushings into place.

Positive stops limit the stroke of the cross-head so that the

depth to which the bushings are pressed is accurately maintained. Only sufficient force to press the bushings into place is exerted on the cylinders. When the cross-head strikes the positive stops, the control lever is released, causing the ram to move upward to the starting position and stop automatically. The locating pins disappear, permitting the work to be removed while the cross-head returns to the starting position.

An automatic hydro-electric device shows a red light when the press fit for any bushing is not in accordance with predetermined specifications. Each pressing pin has its independent cylinder, ram arm, electric switch, and red indicator light. The maximum oil pressure in these small cylinders is controlled by an adjustable valve and is recorded on the gage attached to the cross-head.

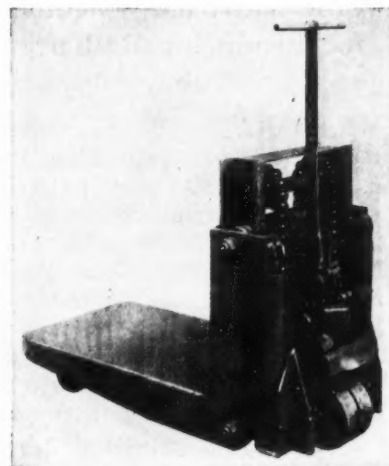
Bristol Pyrotrol Safety Device for Lighting Gas Furnaces

For automatically lighting gas-fired industrial heaters and for protection against explosions as a result of pilot-light failure, the Bristol Co., Waterbury, Conn., has brought out the Pyrotrol device, which is 10 by 10 by 5 1/2 inches, and weighs approximately 5 pounds. It is adapted for use on gas-fired industrial heaters, such as used with large enameling ovens, bright-annealing ovens, and with similar ovens or furnaces.

The main function of this device is to protect the oven against possible failure of the pilot light either in starting up the heater or while the heater is in operation. It may be combined with various other time delays and safety devices for further protection of the heater in case of failure of auxiliary equipment, such as blowers, gas supply feed lines, etc.



Oilgear Press for Assembling Valve Guide Bushings



Yale & Towne Hand-operated Lifting Truck

Yale & Towne Hand-Operated Lifting Trucks

Hand-operated lifting trucks are ordinarily built with a lifting range of from 1 5/8 to 5 inches, but frequently a truck is required that will lift up to 10 inches, which is the range of a hand truck recently brought out by the Yale & Towne Mfg. Co., Philadelphia, Pa. The lifting capacity of this truck, which is here shown, is 8000 pounds. It is a multi-stroke type, 22 forward strokes of the handle serving to lift the load the full height.

The covered deck rises on rollers in the channel uprights. Two heavy-duty hydraulic release checks permit lowering the load without jar or shock. Smooth faced wheels mounted on heavy-duty ball bearings make it possible for two men to pull heavy loads.

A counterweighted, tilting-fork, pallet-handling truck for goods shipped on wooden pallets having about a 2-inch clearance under the load, has also been brought out by this company. This truck will handle both single- and double-faced pallets and can be operated by one man. Only a few strokes of the operating handle are required to lift the work, which is tilted at an angle so that it will ride safely. A hydraulic release check

insures easy lowering of the load when the operator exerts pressure on the treadle located at the side of the head.

Hobart Rods for Arc-Welding Light-Gage Metal

A coated electrode in 1/16-, 3/32-, and 1/8-inch sizes for arc-welding light-gage sheet metal has been brought out by the Hobart Bros. Co., Hobart Square,

Troy, Ohio. Among the welding applications of this electrode, known as "Thinweld," are auto body and fender work; heating and air-conditioning cabinets; ducts; etc. Operators are said to have successfully arc-welded metal as light as 24 gage and even 26 gage with this welding rod. It has been found to be especially well adapted for use with the new 75 and 100 ampere "Simplified" arc-welding machines built by this company.

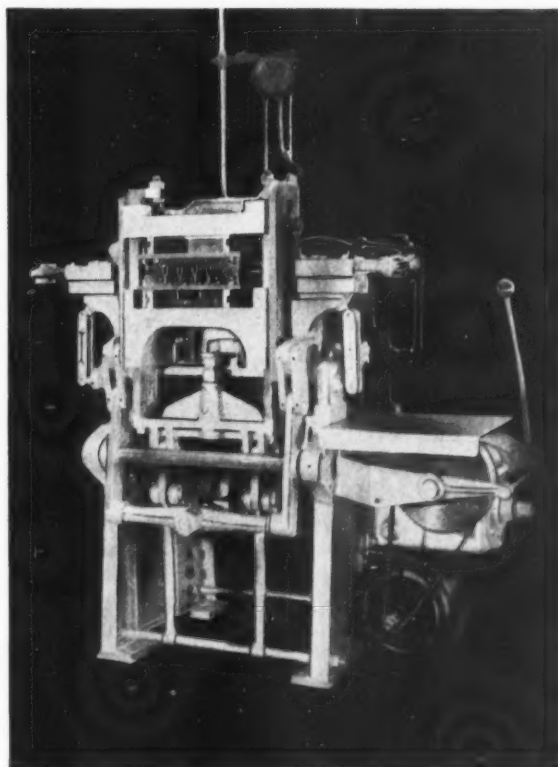
Kux High-Speed Automatic Die-Casting Machine

Plunger pressures up to 1500 pounds per square inch are obtainable through a heavy compression spring on a fully automatic die-casting machine recently developed by the Kux-Lohner Machine Co., 2147 Lexington St., Chicago, Ill. This machine is particularly adapted to die-casting parts that require long inserts. For example, it is well suited for casting lead terminals on the ends of insulated battery cables or on battery grounds. It is also suitable for casting golf club heads on steel shafts.

This Model B-3 machine, which is of vertical construction as may be seen from the illustration, can be operated at speeds up to ten shots a minute for producing die-castings either singly or in multiple. Up to 5 1/2 pounds of lead-base alloys can be cast per shot or up to 3 3/4 pounds of zinc-base alloys. The metal pot has a capacity for 450 pounds of lead or 250 pounds of zinc alloy. Cores are pulled automatically from three sides of dies. Adjustable ejector mechanisms may be mounted in both the upper and

lower die-holding members of the machine.

The machine is constructed of steel castings throughout. It has a die space of 14 by 12 inches and dies up to 7 1/2 inches in thickness may be used. The dies are separated 5 1/2 inches for ejecting the finished castings. The machine is approximately 4 feet square by 4 1/2 feet high.



Kux Automatic Die-casting Machine which Operates Ten Times a Minute



Tapered and Keyed Spindle Nose Used on Reed-Prentice Lathes

Reed-Prentice Lathes Equipped with Tapered and Keyed Spindle Nose

The 14- and 16-inch Model AA sliding gear head engine lathe and Model B tool-room lathe made by the Reed-Prentice Corporation, Worcester, Mass., are now equipped with the new standard lathe spindle nose here illustrated. Advantages claimed for this new spindle nose are greater accuracy, longer life, fewer chucks required through interchangeability, labor saving through simple mounting, safety, and less overhang.

A long hardened taper bearing insures accurate alignment and there is a safety key for holding the chuck in place. The key permits plates or chucks to be hung on the spindle, thus allowing the operator to use both hands when starting and tightening the collar. The key also brings the thread in the collar into alignment with the thread on the faceplate

or chuck. Only twelve to fifteen seconds is required for removing or putting on a faceplate or chuck.

Struthers Motor-Operated Timing Devices

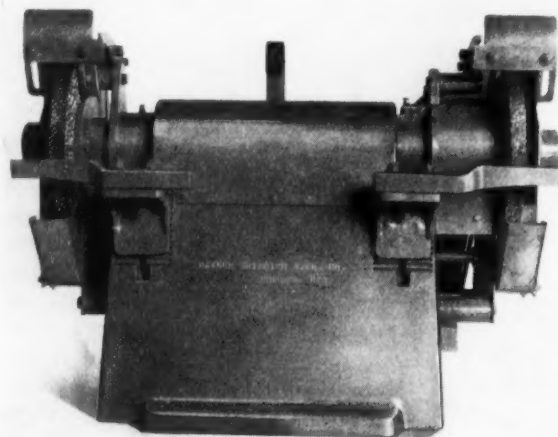
Several motor-operated timing devices, including an immediately recycling type and a continuous-rotating type, have been added to the line of electrical control equipment built by Struthers Dunn, Inc., 139 N. Juniper St., Philadelphia, Pa. The synchronous motor of the recycling device

Ransom High-Speed Grinding Machine

A Type C high-speed grinding machine built in two sizes, weighing 3550 and 3900 pounds, respectively, has been brought out by the Ransom Grinding Machine Co., 320-326 Eighth St., Oshkosh, Wis. This machine is adapted for foundry grinding with high-speed wheels. The larger machine uses grinding wheels 30 inches in diameter and the smaller machine takes wheels 24 inches in diameter. Both machines use wheels having 3-inch faces and 12-inch center holes.

Four speeds are obtained by

changing the sheave on the motor. The drive from the motor to the spindle is by Texropes which run on a spindle sheave of unusually large size. This spindle sheave is placed outside the right-hand end bearing and is so arranged that new Texropes can be installed without disturbing the arbor by simply removing one of the grinding wheels. The speed is so controlled that it is impossible for the grinding wheels to attain too high a speed. The 15-H.P. driving motor is bolted to the back of the machine.



Ransom Grinding Machine Adapted for Foundry Grinding with High-speed Wheels

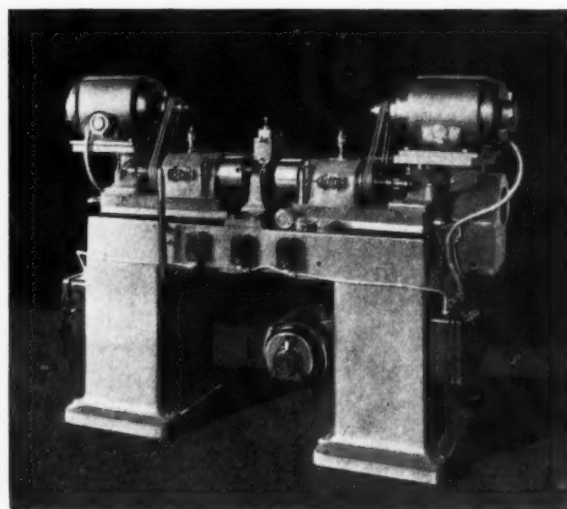


Fig. 1. Coulter Automatic Equipped for Machining Gate Valve Bodies and Wedges

starts when the actuating impulse is received and a solenoid is energized to operate a clutch which connects contact-operating cams with the motor drive. At the end of the cycle, the motor stops and the device is automatically reset to repeat the cycle. The timing is adjustable over a wide range, and practically any desired arrangement of load contacts may be furnished.

The continuously rotating type of timing device can be arranged to have the cams of the timer make one revolution per minute or any other desired speed. Almost any desired number of adjustable or non-adjustable contacts can be furnished.

Coulter Automatic for Facing Gate Valve Bodies and Wedges

The automatic machine shown in Fig. 1 for facing the seats on standard brass gate valves and wedges of the type shown in Fig. 2 has been brought out by the Automatic Machine Co., Bridgeport, Conn. This machine has a capacity for handling valves in sizes up to 2 inches. By changing the work-holding fixtures, both the bodies and wedges can be finished on the same machine. Both seats on the valve parts are finished simultaneously, the machine being arranged to take roughing and finishing cuts. The tool-heads and

spindles run at high speed in ball bearings, making the machine suitable for the use of tungsten-carbide tools. All the automatic movements are controlled by cams.

The operating cycle of the machine ranges from six seconds for the small-sized valves up to twelve seconds for the larger sizes. Change-gears are employed to give the speed adapted for each size valve. Three motors are required, one for each facing spindle and one for driving the camshaft that controls the automatic movements. After the

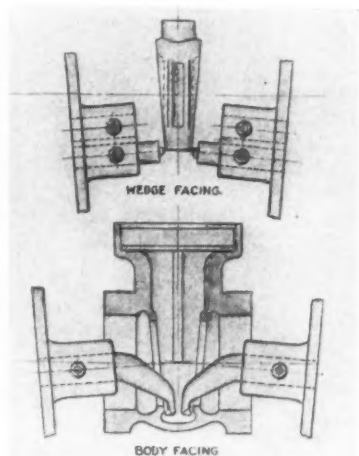


Fig. 2. Brass Valve Parts Faced on Machine Shown in Fig. 1

roughing and finishing cuts are taken, the machine stops automatically to permit removing and replacing the work.

Flexo Cutting-Off, Stamping, and Piercing Press

A machine known as the "Flexopress" has been brought out by Flexo Machines, 2226-2230 N. Racine Ave., Chicago, Ill. This machine is designed to perform three distinct functions. The first of these is the cutting of production materials to uniform lengths up to 9 inches. It handles wire, light metal, and other roll materials.

The second application is the stamping of small parts, such as clips, connectors, spacers, and washers. Usually very simple dies are required, the cost in most cases being from 25 to 60 per cent less than ordinary punch press dies. The third application is the perforating of light metal, paper, cloth, foil, etc.

The automatic built-in feed has an adjustable release which permits alignment of the stock when progressive dies are used. The press is furnished complete with a stand and 1/4-horsepower motor. A four-speed drive is provided, which gives a range of speeds of from 6000 to 18,000 strokes per hour.

Kelly Serrated Inserted-Blade Reamers

Rapid adjustment for regrinding and long blade life are said to be assured by a unique arrangement of double serrated blades and wedges in a new line of reamers brought out by the Kelly Reamer Co., 3775 Ridge Road, Cleveland, Ohio. The blades can be supplied in cobalt high-speed steel, Stellite J-metal, or cemented carbide types.

The blade and wedge slots in the cutter body are tapered longitudinally. The blades are securely held against any radial movement by longitudinal serrations on the blade and body. Radial serrations on the blade engage corresponding serrations on the tapered wedge to prevent endwise movement of the blades.

To expand the blades radially an amount less than the pitch of one blade serration, the blade may be moved forward one or more serrations on the wedge engagement. The inclined longitudinal serrations in the slot provide for a radial adjustment of about 0.004 inch per blade or about 0.008 inch on the diameter, except in the case of the smallest size reamer which has a tooth adjustment of about 0.0025 inch. These reamers are regularly made in sizes of from 1 1/2 up to 6 inches in diameter and in lengths ranging from 2 15/16 to 4 1/2 inches.

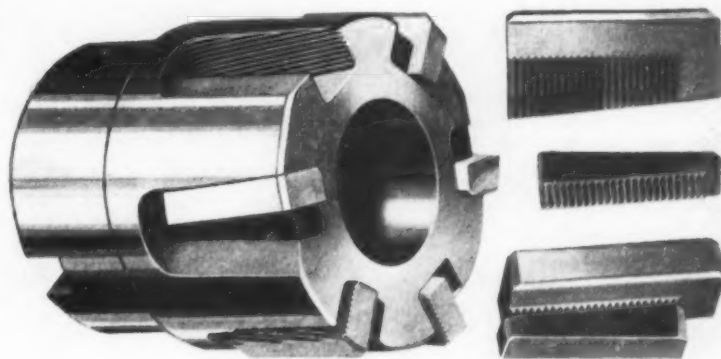


Testing One of the New Type Nicholson Files

New Type Nicholson Files

A new type flat bastard file and a mill bastard file have been brought out by the Nicholson File Co., Providence, R. I. Careful research tests with these new types have shown a decided increase in stock removing capacity and absence of side slips.

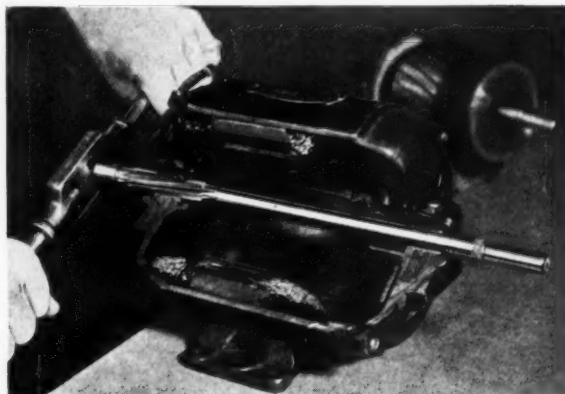
In actual tests, one of the new 12-inch flat bastard files removed 35 per cent more bronze, 25 per cent more cast iron, 25 per cent more copper, and 15 per cent more aluminum than the usual type bastard file of the same size. A new 10-inch mill file removed 20 per cent more stock than the regular 10-inch mill bastard file.



Inserted-blade Reamer Brought out by the Kelly Reamer Co.



Angstrom Incandescent Lamp Blueprinting Machine for Making Prints Up to 24 by 36 Inches



Motor Housing Cut Away to Show Method of Reaming Shaft Bushings with Watervliet Tool

Angstrom Lamp Blueprinting Machine

An Angstrom lamp blueprinter has been developed by the Milligan & Wright Co., 1223 W. Third St., Cleveland, Ohio, for work that is too large to be handled on the 18- by 24-inch size blueprinter described in July, 1935, *MACHINERY*, page 706. The essential features of the previously described model are all retained in this new 24- by 36-inch machine, including the use of incandescent lamps as a source of light and the flat bed printing surface.

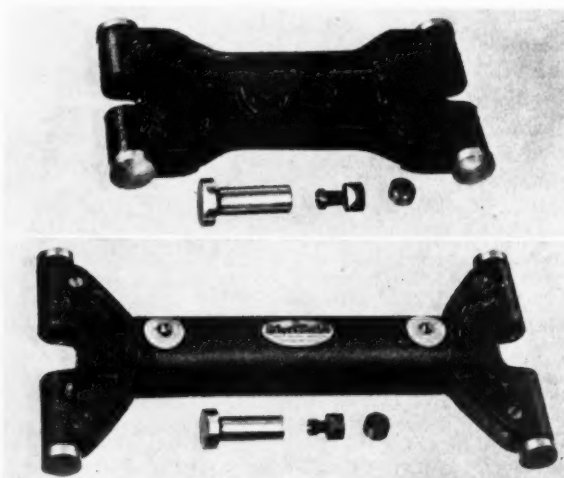
A timing switch of the heavy-duty type is used for automatically breaking the heavier current, and forced ventilation is employed to prevent any tendency to overheat.

Sheffield Adjustable Plug Gages

A line of adjustable plug gages made in two types to cover a range of sizes from 2 1/2 to 12 1/2 inches, as well as special sizes, has been brought out by the Sheffield Gage Corporation, Dayton, Ohio. These plug gages are adapted for checking all kinds of holes for diameter, roundness,

and taper, as well as for checking the widths of slots, etc., by the use of flat anvils. The gages can be continuously readjusted to compensate for wear, and may be furnished with either button or pin type anvils.

The gage shown in the upper view of the illustration is furnished in sizes up to 4 inches, while the gage shown in the lower view is made to cover the remaining sizes. Twenty-three standard sizes are regularly made. The frames are made of heat-treated and seasoned alloy iron and are given a fine crackle finish. Each gage can be quickly adjusted to any diameter within its range and is locked by a screw designed to prevent distortion.



Sheffield Adjustable Plug Gages for Checking Holes and Widths of Slots

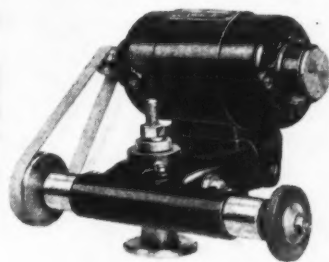
Expansion Reamer for Motor Shaft Bushings

A spiral self-aligning expansion reamer with a tapered floating collet for use in servicing fractional-horsepower motors has been placed on the market by the Watervliet Tool Co., Inc., Albany, N. Y. This tool is especially designed for reaming motor shaft bushings. After new bushings have been pressed into place, the tapered floating collet of the reamer is placed in one of the bushings, where it will center itself. The long pilot end of the reamer is then passed through the bushing on the other end of the motor housing. After one side has been reamed, the collet is removed and placed in the reamed bushing to permit the other bushing to be reamed. It is claimed that bearings reamed in this way are so accurately aligned that no "running in" or second reaming operation is necessary.

The reamer is set to the required size by means of the adjusting plug in the head which expands the reamer very slowly. The range of expansion extends both above and below standard shaft sizes, thus taking care of under-sized shafts.

"Spee-Dee" Lathe Grinder

Vibrationless high speeds up to 42,500 revolutions per minute, when needed, are available on the No. 11 "Spee-Dee" lathe grinder recently added to the line of grinders made by the Dumore Co., Racine, Wis. This new grinder can be used on practically any machine tool, including lathes, shapers, milling machines, planers, and universal grinding machines. It is of compact design and is arranged to utilize the maximum capacity of the ma-



"Spee-Dee" Lathe Grinder Brought out by the Dumore Co.

chines upon which it is used.

A 2-inch straight wheel can be used for a large variety of external grinding jobs. It will also grind holes 1/2 inch in diameter or larger to a depth of 2 1/2 inches. Smaller holes can be ground to a depth of 1 inch with wheels held in the 1/8-inch collet type chuck. The grinding spindle ordinarily operates at 6000 revolutions per minute for external work and 30,000 revolutions per minute for internal work. The armature of the 1/5-horsepower motor is dynamically balanced and is equipped with ball bearings.

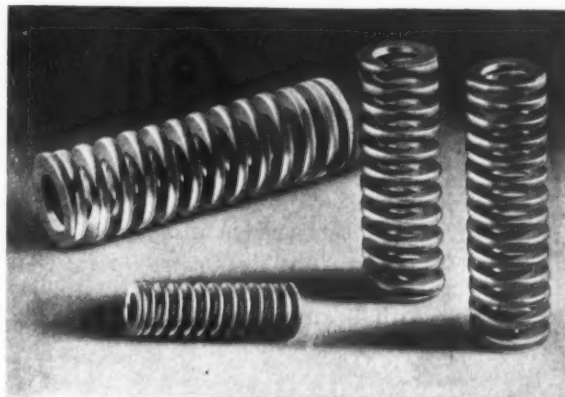


Fig. 1. Danly Die Springs of Rectangular Cross-section after being Coiled

Danly Flat-Rounded Die Springs

Die springs having a new style of cross-section are being introduced on the market by Danly Machine Specialties, Inc., 2112 S. 52nd Ave., Chicago, Ill. Typical examples of these springs are shown in Fig. 1. They are coiled from wire having a cross-section of the shape shown at the left in Fig. 2 which, when coiled, assumes the rectangular cross-section shown at the right. It is claimed that the full strength, flexibility, and fatigue life of the wire are developed by this method.

In developing these springs, preliminary tests were made over a two-year period for selecting the steel. Then another year was spent in developing the proper section for each of the fifteen standard free lengths in which these springs are made. The springs are available in various sizes having hole diameters from 3/4 inch to 2 inches.



Fig. 2. (Left) "Keystone" Cross-section of the Spring Stock. (Right) Cross-section after Coiling

Coiling of these springs is done by automatic machinery. After the coiling, each spring is heat-treated by a carefully controlled process. The springs are laid flat on a furnace conveyor and after being brought to the desired temperature are quenched in an oil bath of fixed temperature without being exposed to the air. The springs are next carried to additional furnaces for the drawing operation, after which they move to japaning ovens. This heat-treatment insures uniform hardness.



Drawing Table Made by the Drafto Co.

Drafto Drawing Table

An adjustable drafting board with circular chrome-plated supports having ends that telescope into the legs of a steel tubing frame has been brought out by the Drafto Co., Cochranton, Pa. The height of the table can be adjusted from 32 to 40 inches, and the table can be tilted from the horizontal to the vertical position on either side of the stand.

The steel tubing construction combines strength with light weight, the complete table weighing only 30 pounds. The table-supporting loops and cross-

rods are chromium-plated and the clamps, brackets, and legs are finished in black baked enamel. The board shown in the illustration is 23 by 31 inches.

New Types of Athol Vises

The heavy-duty steamfitter's vise designed for heavy pipe work, shown in Fig. 1, and the milling and drilling machine vise with a removable swivel base, shown in Fig. 2, are new developments of the Athol Machine & Foundry Co., Athol, Mass. The jaw facings of the steamfitter's vise are shaped to hold all sizes of pipe from 1/8 to 6 inches. The front jaw is fixed and the back jaw is movable, a feature which allows long lengths of pipe to rest upon the bench while being clamped in the vise. The buttress thread screw is equipped with a removable nut.

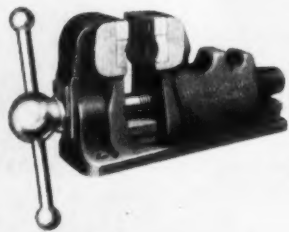


Fig. 1. Athol Heavy-duty Steamfitter's Vise with Fixed Front Jaw

The jaws are 5 inches wide. The vise weighs 137 pounds.

The milling machine vise has a removable swivel indexing base and is adapted for a wide range of machine shop uses. When used

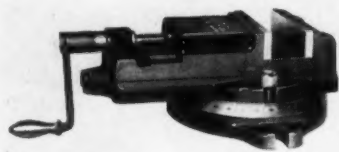
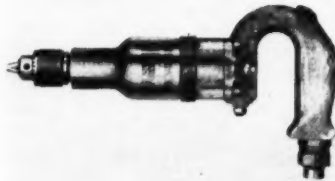


Fig. 2. Milling Machine Vise with Removable Indexing Base

with the indexing base, operations requiring accurate angular settings are easily performed. Removed from the swivel base, the vise is adapted for drilling machine and other uses.

The indexing base is graduated 90 degrees each side of the zero point. Inexpensive false jaws may be provided to hold any shape work. This vise is available with 4- and 6-inch jaws.



Hercules Light-weight Pneumatic Drill

Hercules Pneumatic Portable Drill

A pneumatic drill designed especially for use in the fabrication of bus bodies, airplanes, refrigerator cabinets, and similar work has been brought out by the Buckeye Portable Tool Co., Dayton, Ohio. This Hercules drill has a capacity of 1/4 inch, a speed of 2200 revolutions per minute, weighs 4 1/2 pounds, and is 12 inches long over all. The small size and light weight permit this drill to be held in one hand. It can be started and stopped by a thumb-lock throttle.

Dumore Diamond-Point Grinding Wheel Dresser

A diamond wheel dresser designed to clean up loaded out-of-true grinding wheels has been brought out by the Dumore Co., Racine, Wis. This dresser somewhat resembles a C-clamp or micrometer, except that the anvil is in the form of a V-block and carries the dressing diamond on the outer end opposite the vee. Provision is also made for transferring the diamond-holding anvil to a crosswise hole or from

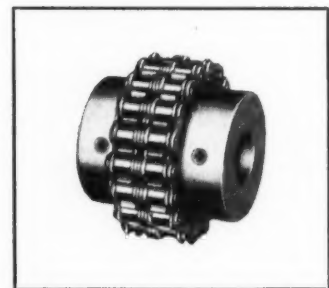


Dumore Diamond-point Grinding Wheel Dresser

the end to the side for use in truing sides of wheels, etc. The vee permits the dresser to be clamped to the toolpost or to a round bar held in the chuck.

Diamond Improved Chain Type Flexible Coupling

The chain type flexible coupling made by the Diamond Chain & Mfg. Co., Indianapolis, Ind., now consists of two sprockets encircled by a length of double-strand roller chain. Clearance is provided between the sprocket teeth and the chain side-plate to permit misalignment of the connected shafts.



Diamond Chain Type Flexible Coupling of Improved Design

The flexibility of this improved coupling depends on the design rather than the material used. Adequate flexibility, strength, and durability are obtained by the all-steel construction. All couplings of this company's manufacture are now made with double-strand chain instead of single strand to increase the horsepower capacity and also to permit the couplings to be used on larger shafts without increasing the outside diameter.

Polymerized Wax Sulphur-Base Cutting Oil

A polymerized wax sulphur-base cutting oil containing 12 per cent sulphur and which mixes in all proportions with mineral oils, fuel oils, or kerosene, has been developed by the Quaker Chemical Products Corporation, Conshohocken, Pa. This cutting oil, known as "Quaker Kut Base No. 27," is a clear claret-red color.

Waxes, as well as polymerized oil and fatty alcohol, form the basis of the material for absorbing the sulphur. The sulphur absorption is claimed to be so complete that this base will not stain brass or copper. All the oils used in the material are polymerized. Unusual lubricating properties and high film strength are among the advantages claimed.

* * *

Detroit Engineers Give Vocational Guidance to High-School Students

For the benefit of high-school students contemplating the study of engineering, the Associated Technical Societies of Detroit recently held its first annual guidance meeting at which 123 boys and their parents were given an opportunity to consult representatives of various branches of the engineering profession. The conference was an outgrowth of the activities of the Committee on Student Selection and Guidance of the Engineers' Council for Professional Development, and was typical of guidance meetings which this Council is promoting in other areas through local associations of engineers. The movement aims to promote better engineering education.

Metallurgy in the Automobile Industry

The importance that metallurgy plays in the construction of the automobile is perhaps not generally recognized. In order to emphasize this importance and to provide in popular form a brief review of the primary elements of the metallurgy of iron and steel, the General Motors Corporation, Research Laboratory Section, Detroit, Mich., has published a booklet, "Metallurgy and Wheels," giving in convenient and easily read form a brief review of the entire history of iron and steel, from the ore to the finished product. The book is obtainable free of charge from the Research Laboratories of the General Motors Corporation. The same series of booklets also includes "Chemistry and Wheels"; "When the Wheels Revolve"; and "Diesel, the Modern Power."

* * *

Silver Spoons Made by Die-Casting and Coining

Spoons are being die-cast in Europe from silver and German silver in the form of blanks, such as shown at the top and middle of the accompanying illustration, and then coined to the shape shown at the bottom. Forks are also produced in a similar way.



Two Stages in the Manufacture of a German Silver Spoon by Die-casting and Coining

The original practice was to produce the finished forks and spoons in a single die-casting operation, but on account of the wide variety of designs required, the die cost was too expensive. By the present method, the plain blanks are die-cast in cheap dies, and the coining dies necessary for the variety of spoon and fork designs are also inexpensive.

The die-casting is done in a Schuler-Polak machine from semi-plastic silver or German silver which is ladled into a chamber in the top of the dies. A hydraulic plunger forces the metal into the die cavities at a pressure of about 14,000 pounds per square inch. The parts are annealed between the die-casting and coining.

* * *

Record Auto Output

The Automobile Manufacturers' Association, 366 Madison Ave., New York City, announces that members of the Association, which includes all important automobile manufacturers except Ford, shipped more motor vehicles from their factories in June, 1936, than in any previous June in the history of the organization. The June factory sales of the member companies amounted to 367,303 units, an increase of 34 per cent over the corresponding month last year. In the first six months of this year 1,963,500 cars were shipped, compared with 1,535,750 cars in the same period last year.

* * *

According to the Copper & Brass Research Association, the largest brass cannon ever cast was made in India in 1548 and weighs 80 tons. To this day it remains an unsolved mystery how it was ever transported to where it is mounted.

Safety Device Assures Use of Goggles

To make sure that the operator's eyes are adequately protected, the C. F. Burgess Laboratories, Inc., Freeport, Ill., has developed a novel device for various types of grinding machines. This device is designed to



Grinding Machine Equipped with Device that Prevents Motor from Being Started until Goggles are Removed from Tray

insure the use of goggles when the grinding machines are in operation. It consists of a tray or holder on which the goggles are placed when not in use. One end of the tray rests on the actuating plunger of an electric switch, connected in the grinder motor circuit. As long as the goggles remain on the tray, their weight holds the switch in an open position, so that the grinder motor will not start. When the operator removes the goggles, the weight on the switch is reduced, closing the circuit and starting the motor.

* * *

Norma-Hoffmann Has a 25-Year Anniversary

The Norma-Hoffmann Bearings Corporation, Stamford, Conn., manufacturer of precision ball, roller, and thrust bearings, is celebrating its twenty-fifth anniversary this year. The company was founded in 1911 by Walter M. Nones, who is still its president. Today the company makes 108 distinct series of bearings, representing approximately 3000 types and sizes, to meet the needs of varying industrial requirements.

Automobile Industry Leads the Way to Real Recovery

Speaking at the annual meeting of the Automobile Manufacturers' Association, Alvan Macauley, president of the Association and of the Packard Motor Car Co., pointed to the remarkable record made by the automobile industry in courageously facing the depression and in leading the way out of it, through the normal processes of individual enterprise unaided by governmental assistance.

Mr. Macauley recorded several important facts: First, that the automobile factory worker is earning more per hour now than in 1929, although living costs, according to the Government's figures, are 20 per cent below those of 1929; second, that the industry has done such an outstanding job in the stabilizing of employment that the workers in the industry are receiving a larger real annual income than in 1929, although working shorter hours per week; and third, that since last November the automobile industry has continuously employed over 350,000 people.

Mr. Macauley stated that, in tracing the history of the automobile industry, one notes that its success is inherent in the industry's methods, and is due to the system of free competition under which this country has developed.

In spite of the fact that during the period from 1930 to 1932 the sales of the automobile industry decreased nearly 75 per cent, the industry never became stagnant. Engineering developments, as well as plant improvements for greater efficiency, were actively prosecuted. By so doing, this industry stimulated the subsequent upturn in other industries. The income from sales of automobiles was in large part spent by the automobile industry for the buying of steel, rubber, lumber, and other materials, machinery, and tools.

The speaker further emphasized that we are confronted in this country with the spread of ideas foreign to the past ideals of American life. "Many of the factors acting today," said Mr. Macauley, "are a deterrent to business and industry and are socialistic in form and character. Contrasted with this is the automobile industry's success in stimulating buying, increasing and stabilizing employment, raising wages, and sharing other benefits with all employees. These factual accomplishments stand out as highly significant

and worthy of the thoughtful study of the American people. The automobile industry's record may be pointed to as an evidence of the value of the system which has given this country prosperity and a high standard of living."

* * *

Government Interference with the American Industrial System

According to a booklet entitled "Government Interference with the American Industrial System," published by the well-known business economists, Allen W. Rucker and N. W. Pickering, governmental interference with factory wage rates has created a distortion between industrial and farm prices. The booklet concludes that industry has never failed, through improved machinery and methods, to promptly balance its costs and prices with the farm price level, until and unless interfered with by legislative control. It further concludes that government interference is a major cause both of the intensity of the depression and of the slowness of recovery.

The most prosperous periods in American life have been those in which the prices of manufactured goods relative to farm prices have been reduced. Such reduction in price has always been accompanied by increased employment, purchasing power, and consumption. The booklet is obtainable from the Farrel-Birmingham Co., Ansonia, Conn.

* * *

Eraser of Spun Glass

Hundreds of spun glass fibers bonded together with a flexible solution, make up an eraser recently placed on the market by the Eraser Co., Inc., 120 E. Washington St., Syracuse, N. Y. This eraser is held in a molded plastic holder of about the same size and weight as a small fountain pen. It is fed from one end of the holder by revolving the top section. When the eraser has been completely used up, a new one can be inserted. It is especially suitable for removing India ink from tracings or for use by stenographers and bookkeepers.

NEWS OF THE INDUSTRY

Colorado

LINCOLN ELECTRIC Co., Cleveland, Ohio, manufacturer of "Shield Arc" welders, electrodes, and "Linc-Weld" motors, has appointed the INTERMOUNTAIN BELTING & PACKING Co., 1414 Wazee St., Denver,

the future at the Pratt & Whitney Division in Hartford, Conn. C. K. SEYMOUR, whom Mr. Burt succeeds as president, will continue as a director and as treasurer of the company. Mr. Burt first came with the Pratt & Whitney Co. in 1924 as general manager; in 1925 he



J. H. Johnson, President of the Intermountain Belting & Packing Co.

Col., as agent to cover the state of Colorado and part of Kansas, Nebraska, and Wyoming. J. H. JOHNSON is president of the Intermountain Belting & Packing Co.



Blackstone Studios

Clayton R. Burt, Elected President of the Niles-Bement-Pond Co.

became vice-president and a director; and in 1930 he was elected president. He is also a former president of the Manufacturers Association of Hartford County and of the Hartford Chamber of Commerce.

Connecticut and Massachusetts

GEORGE SCHERR Co., INC., 128 Lafayette St., New York City, dealer in machine tools and precision measuring instruments, has appointed RUSSEL M. COLDWELL, East Berlin, Conn., special representative for Carl Zeiss optical measuring methods and instruments. Mr. Coldwell, who is an expert on precision measurements, is in a position to conduct demonstrations right at the plants of manufacturers in his district. He will bring a representative assortment of Zeiss tools and instruments directly to the manufacturer's door by means of a demonstration truck specially built for the purpose.

CLAYTON R. BURT, formerly president of the Pratt & Whitney Co., Hartford, Conn., has been elected president of the Niles-Bement-Pond Co., the two companies having been merged. The principal office of the Niles-Bement-Pond Co., which formerly has been at 111 Broadway, New York City, will be located in



© Bachrach

Robert S. Rose, of the Vanadium-Alloys Steel Co.

ROBERT S. ROSE, of the service and metallurgical department of the Vanadium-Alloys Steel Co. and the Colonial Steel Co., will be transferred from Springfield, Mass., to Boston to fill the vacancy caused by the death of Jim Mitchell, the oldest sales employee of the Colonial Steel Co. Mr. Rose has been located in Springfield for the last five years, handling district service and metallurgical work.

Illinois and Wisconsin

WILLIAM H. PHILLIPS, recently with the Harry Pratt Co., Chicago, Ill., has joined the Worthington Pump & Machinery Corporation, Harrison, N. J., as power plant specialist, with headquarters at the corporation's Chicago office. Mr. Phillips had been associated for many years previously with the Worthington corporation.

WALLACE W. SMITH has been appointed assistant vice-president in charge of the sale of structural shapes, plates, floor plates, and steel-sheet piling of the Inland Steel Co., Chicago, Ill. MAURICE E. O'BRIEN has been made manager of sales of carbon-steel bars and billets.

WALTER M. FAIRBAIN, works manager of the Barnes Drill Co., Rockford, Ill., sailed recently for several months' stay in Europe, where he will visit all of the Barnes Drill Co.'s agencies with a view to furthering the development of the company's export business.

MILCOR STEEL Co., Milwaukee, Wis., has become a completely owned subsidiary of the Inland Steel Co., Chicago. No changes will be made in the management or operations. LOUIS KUEHN, president of the Milcor Steel Co., as well as



Louis Kuehn, President of the Milcor Steel Co.

the other officers, will continue to operate the company as a unit. The Milcor Steel Co. manufactures sheet-metal building products with plants at Milwaukee, Wis., and Canton, Ohio.

ROSENFELD MACHINERY CORPORATION, dealers in new and used machinery, motors, and accessories, has moved into the firm's own building at 950 W. Lake St., Chicago, Ill., where larger quarters and improved facilities will enable the company to adequately meet its increasing business.

R. G. HASKINS CO., 4634 W. Fulton St., Chicago, Ill., has appointed GEORGE G. PRAGST, exclusive distributor in the New England states for the Haskins high-speed tapping machines.

CUTLER-HAMMER, INC., 12th and St. Paul Ave., Milwaukee, Wis., manufacturer of electric motor control apparatus, announces that the Los Angeles sales office of the company has been moved to new quarters at 1331 Santa Fe Ave. W. G. TAPPING is in charge of this office.

Michigan

DETROIT REX PRODUCTS Co., Detroit, Mich., announces that the company has registered the trade name "Detrex" in the U. S. Patent Office to apply to its line of degreasing machines which are used in the metal-working industries to remove grease, oil, buffing compounds, etc., previous to plating, enameling, and other finishing operations.

ROGER E. MITCHELL, formerly general tool supervisor of the Buick Motor Co., Flint, Mich., has been appointed assistant master mechanic. Mr. Mitchell joined the Buick organization in 1916



Roger E. Mitchell, Assistant Master Mechanic of the Buick Motor Co.

as tool designer. One year later he was placed in charge of the drafting-room in the motor plant. In 1932 he was appointed process engineer of the motor plant, and in 1934 he was made general tool supervisor.

MICHIGAN TOOL Co., Detroit, Mich., has appointed the BRAMMER MACHINE & TOOL SERVICE, 104 Tulsa Bldg., Tulsa, Okla., agent for the Mitco line of cutting tools, cemented tungsten-carbide tools, and Michigan gear finishing, lapping, and checking equipment in Kansas, Oklahoma, and northern Texas.

FRED C. PYPER, formerly assistant master mechanic of the Buick Motor Co., Flint, Mich., has been promoted to the position of general master mechanic. Mr. Pyper joined the Buick organization in 1916 as foreman of tool grinding. He was then promoted to the position of tool supervisor of the motor plant and



Fred C. Pyper, General Master Mechanic, Buick Motor Co.

later became general tool supervisor for the entire Buick plant. Two years ago he was appointed assistant master mechanic, in which position he is succeeded by Roger E. Mitchell.

GRAND RAPIDS STAMPING DIVISION OF THE GENERAL MOTORS CORPORATION, Grand Rapids, Mich., is now in operation producing small body dies. Later, through the installation of very large planers and profiling machines, large one-piece dies for seamless steel roofs of turret-top bodies will be made.

RAWLPLUG DETROIT Co., 14415 Myers Road, Detroit, Mich., has been formed by R. G. and T. C. Moeller to handle the products of the Rawlplug Co., Inc., New York City, manufacturer of anchoring devices.

K. R. BEARDSLEE, former Pittsburgh district sales manager of the Carboloy



K. R. Beardslee, General Sales Manager of the Carboloy Co.

Co., Inc., Detroit, Mich., has been appointed general sales manager of the company.

CARBOLoy Co., INC., Detroit, Mich., announces that W. G. ROBBINS, formerly vice-president and general sales manager, has been elected president of the company, succeeding DR. ZAY JEFFRIES, who has become chairman of the board. A. MacKENZIE, former manager of manufacturing, has been elected vice-president in charge of manufacturing. J. R. LONGWELL, formerly die engineer, has been appointed chief engineer. A. A. MERRY, formerly Cleveland district sales manager, has been appointed special representative in charge of activities with agents licensed to supply Carboloy on their tools, dies, and machines.

MICHIANA PRODUCTS CORPORATION, Michigan City, Ind., maker of stainless and heat-resistant alloy steel castings, has appointed C. Q. SWENSON, 2842 W. Grand Blvd., Detroit, Michigan representative.

Missouri and Tennessee

EMERSON ELECTRIC MFG. Co., St. Louis, Mo., has recently leased approximately 43,000 square feet of floor space for warehouse purposes. The offices of the company are being moved to 19th and Washington Aves., St. Louis. These changes will provide additional space for manufacturing operations.

AMERICAN LAVA CORPORATION, Chattanooga, Tenn., has completed a new plant with three times the capacity of the old plant and providing, as well, an adequate research laboratory. The company manufactures insulating and high-heat resisting parts for electrical, gas, and oil appliances.

New York and New Jersey

DR. L. H. BAEKELAND, president and founder of the Bakelite Corporation, New York City, has been made an honorary member of the Royal Society of Edinburgh, Scotland. The best known of Dr. Baekeland's inventions is Bakelite resinoid, the well-known plastic material which was first announced in 1909. The Royal Society of Edinburgh is an institution founded in 1783, whose members consist of those who have distinguished themselves in scientific achievements.

BINGHAMTON FLEXIBLE SHAFT CO., Johnson City, N. Y., has acquired temporary quarters for the manufacture of flexible-shaft machines and flexible-shaft equipment, and is now in a position to furnish repairs to old equipment as well as to supply new equipment.

FOXBORO Co., Foxboro, Mass., manufacturer of controlling, recording, and indicating instruments for temperature, pressure, humidity, and the flow of fluids, has appointed the G. M. BASFORD Co., 60 E. 42nd St., New York City, as advertising and marketing counsel.

HARRY T. SMITH, traffic manager of the Worthington Pump & Machinery Corporation, Harrison, N. J., completed fifty years of continuous service with that organization on July 8, in honor of which a testimonial luncheon was given to him at the Newark Athletic Club, Newark, N. J.

Ohio

WESTINGHOUSE ELECTRIC & MFG. CO., East Pittsburgh, Pa., announces that due to the necessity for expanding the production facilities of the company's Springfield, Mass., works for the manufacture of refrigeration and air-conditioning units, the manufacture of small motors now made at Springfield will be transferred to Lima, Ohio. The Westinghouse company has acquired the plant formerly owned by the Relay Motors Corporation at Lima and will start the installation of machinery required for the manufacture of small motors immediately. The plant will be under the direction of R. F. FRENGER. The motor production facilities at Lima will be approximately 50 per cent greater than those now available at Springfield.

CLEVELAND TWIST DRILL CO., Cleveland, Ohio, has announced plans for a \$500,000 construction program to be undertaken at once. Three buildings, the oldest of the ten comprising the company's plant, will be torn down and will be replaced with an L-shaped five-story-and-basement building to house the offices, stock and shipping rooms, and several manufacturing departments. The new building will have 106,000 square feet of floor space as compared with 40,000 in the

buildings to be demolished. The new building will be of the most modern construction in every respect. The offices, which will be on the fifth floor, will be completely air-conditioned, both winter and summer.

DEAN HERMAN SCHNEIDER of the University of Cincinnati has been awarded the Lamme medal for his achievements in engineering education. The award was made at the annual dinner of the Society for the Promotion of Engineering Education recently held at the University of Wisconsin, Madison, Wis. Dean Schneider instituted the cooperative plan of engineering education at the University of Cincinnati in 1906.

REPUBLIC STEEL CORPORATION, Cleveland, Ohio, announces that the CONNER MFG. CO., Louisville, Ky., has been appointed distributor of Enduro stainless steel, serving northwestern Kentucky; TAYLOR-PARKER CO., INC., Norfolk, Va., has been appointed distributor of Republic tubular products; and CHARLES MILLAR & SON CO., Utica, N. Y., has been appointed distributor of Enduro stainless steel.

CLEVELAND DUPLEX MACHINERY CO., INC., W. 3rd and Lakeside Ave., Cleveland, Ohio, has been appointed exclusive agent for a number of machine tool lines by Bryant Machinery & Engineering Co., Chicago, Ill., general distributor for Boye & Emmes Machine Tool Co., Cleereman Machine Tool Co., Dreses Machine Tool Co., Kling Bros. Engineering Works, and the Ohio Machine Tool Co.

CHAIN PRODUCTS Co., Cleveland, Ohio, announces that the company has changed its name to the HODELL CHAIN CO., in order to make the corporate name more closely conform to the company's products, known as "Hodell chains." The change in name does not involve any change in personnel, officers, or policies. The company has just celebrated its fiftieth anniversary.

J. H. HERRON, president of the James H. Herron Co., Cleveland, Ohio, a company doing general consulting engineering work, inspection, and testing on materials, structures, and foundations, and which maintains chemical, physical, and metallurgical research laboratories, has been nominated for president of the American Society of Mechanical Engineers for the year 1937.

S. M. JONES Co., Toledo, Ohio, manufacturer of oil-well supplies, has awarded contracts totalling \$150,000 for an extensive plant modernization program consisting largely of modern shop equipment with some building additions. A great deal of obsolete equipment is being replaced and the plant is being thoroughly modernized.

HELLER Co., Cleveland, Ohio, manufacturer of steel staples and stapling equipment for packing boxes or cartons for

shipment, has announced the inauguration of a new merchandising policy, whereby stapling machines are lent or rented to users of Heller staples.

Pennsylvania and Maryland

M. E. LEEDS, president of Leeds & Northrup Co., Philadelphia, Pa., has recently been the recipient of two outstanding honors. As mentioned in July



M. E. Leeds, President, Leeds & Northrup Co., who has been awarded the Degree of Doctor of Engineering by the Polytechnic Institute of Brooklyn

MACHINERY, he has received the Henry L. Gantt gold medal, awarded annually by the Institute of Management "for distinguished achievements in industrial management as a service to the community." He has also had conferred upon him the honorary degree of Doctor of Engineering by the Polytechnic Institute of Brooklyn "in recognition of great service to society." Mr. Leeds is widely known for his far-sighted social philosophy and his understanding of the factors that underlie harmonious relations between employer and employee. His company has been a pioneer in the adoption of progressive policies in employee relations and in the recognition of the common interest of a manufacturing enterprise and those in its employ.

WILLIAM P. EWING has been made executive vice-president of the Superior Steel Corporation, Pittsburgh, Pa. Mr. Ewing has been connected with the company since 1918, having previously been vice-president in charge of sales. L. W. BRIGGS, formerly general manager of sales of the West Leechburg Steel Co.,

has been made vice-president in charge of sales, succeeding Mr. Ewing. DAVID PRYDE, manager of works of the Superior Steel Corporation, has been made vice-president in charge of operations.

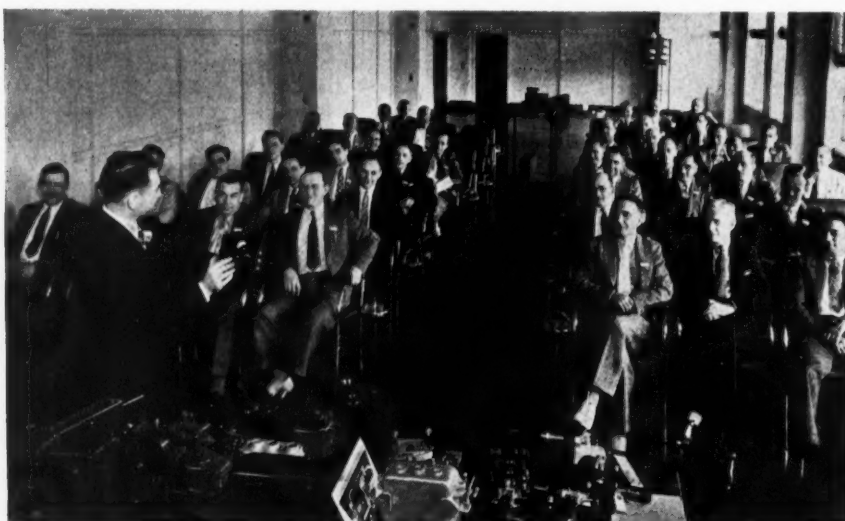
GENERAL REFRACTORIES Co., Philadelphia, Pa., has removed its general offices to new quarters in the Real Estate Trust Building at Broad and Chestnut Sts.

ARTHUR M. EAST, formerly associate director of the Federal Housing Administration for western New York, has been appointed New York representative of the Commercial Credit Co., Inc., Baltimore, Md. Mr. East will cooperate with manufacturers in financing problems involving the sales of manufacturing equipment and facilities.

* * *

Westinghouse Stages Machine Tool Electrification Forum

During recent months there has been an insistent demand from machine tool manufacturers for better knowledge of electrical devices applicable to machine tool operation. With a view to supplying this demand, the Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa., invited executives and engineers of the machine tool industry to attend a four-day forum on machine tool electrification at East Pittsburgh. The meeting was held June 22 to 25. More than fifty representatives of leading machine tool builders attended. The subjects discussed included the application of motors, controls, protective equipment, gearmotors, meters, and methods of reducing maintenance costs. A score of the delegates stayed an extra day to discuss special application problems with the Westinghouse control and motor engineers. The interest displayed by those attending gave evidence of the value of such informal conferences.



A Group of the Machine Tool Engineers that Took Part in the Westinghouse Electrification Forum

NEW BOOKS AND PUBLICATIONS

ELEMENTARY MECHANISM. By Philip K. Slaymaker. 181 pages, 6 by 9 inches. Published by D. Van Nostrand Co., Inc., 250 Fourth Ave., New York City. Price, \$3.

This book deals with the subject of motion transmission and as the established methods have not been changed, it is primarily concerned with describing the ever-widening fields of application of the various methods employed. The author has been engaged in teaching this subject for twenty-eight years and the experience gained, together with nine years of practical experience, forms the basis of this book. The text is divided into thirteen chapters dealing with the following subjects: Fundamental Principles; Constrained Motion; Motion Transmission; Instant Centers—Points of Common Velocity; Intermediate Connectors—Linkage; Intermediate Connectors—Flexible Connectors; Direct Contact—Rolling Contact; Direct Contact—Sliding Contact—Cams; Direct Contact—Sliding Contact—Gearing; Gearing (Continued)—Involute System—Axes Parallel; Gearing (Continued)—Cycloidal System—Axes Parallel; Gearing (Continued)—Axes not Parallel; Gear Trains—Epicyclic Trains.

AMERICAN STANDARDS ASSOCIATION PUBLICATIONS: American Standard Preferred Numbers, price, 25 cents; Tentative Standards for Noise Measurement, price, 25 cents; Drawings and Drafting-Room Practice, price, 45 cents; Wrought-Iron and Wrought-Steel Pipe, price, 50 cents; Socket Set-Screws and Socket-Head Cap-Screws, price, 40 cents; Brass Fittings for Flared Copper Tubes, price,

35 cents; Cast-Iron Soil Pipe and Fittings, price, 65 cents; Rotating Electrical Machinery, price, \$1.30; Sound Level Meters, price, 25 cents. Published by the American Standards Association, 29 West 39th St., New York City.

ENGINEERING QUESTIONS AND ANSWERS (Volume I). 176 pages, 7 1/2 by 10 inches. Published by Emmott & Co., Ltd., 28 Bedford St., London, W.C.2, England. Price, 6s.

This book contains a collection of questions and answers that were originally published in the British publication *Mechanical World*. Consequently, the book covers briefly a great number of subjects, all the way from the design of steel roof trusses, through air compressor design, gearing, and turbine pumps, to recipes for lacquers for tins. There is a great deal of information on many subjects in the book.

PERSPECTIVE AND OPTICAL ILLUSIONS OF DEPTH. By Theodore M. Edison. 44 pages, 6 by 9 inches. Published by Calibron Products, Inc., West Orange, N. J. Price, 50 cents.

The first section of this book deals with "Gages of Depth" and mentions several striking optical illusions. The more technical "Perspective Methods" section starts with a historical note and then covers the subject of perspective in a comprehensive manner. The third section is devoted to various applications of the perspective method, including aerial mapping.

PRODUCTION, HEAT-TREATMENT, AND PROPERTIES OF IRON ALLOYS. 40 pages 6 by 9 inches. Published by the United States Department of Commerce, Washington, D. C., as Circular C409 of the National Bureau of Standards. Price, 10 cents.

SYMPOSIUM ON PEARLITIC MALLEABLE CAST IRON. 32 pages, 6 by 9 inches. Published by the American Society for Testing Materials, 260 S. Broad St., Philadelphia, Pa. Price, 60 cents; ten or more copies, 45 cents each.

PROSPERITY THROUGH CONSISTENT PRICES. By E. S. Pillsbury, president, Century Electric Co., St. Louis, Mo. 8 pages, 9 by 12 inches. Obtainable free of charge from the Century Electric Co., St. Louis, Mo.

TAPER ROLLER BEARINGS. 9 pages, 6 by 9 inches. Published by the U. S. Department of Commerce, Washington, D. C., as Simplified Practice Recommendation R67-36. Price, 5 cents.

Barnes Horizontal and Vertical Honing Machines

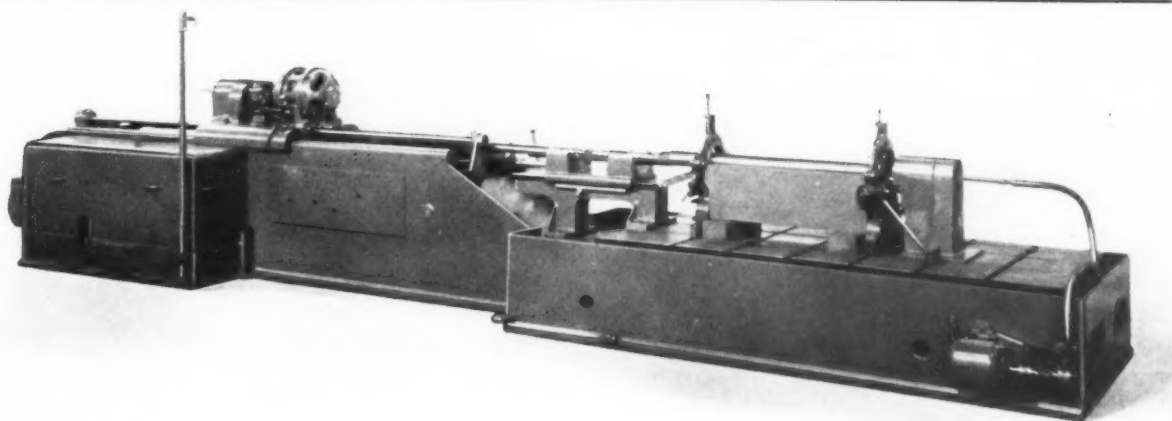


Fig. 1. Tubes Seven Feet Long will be Honed at the Show on the Barnes Horizontal Honing Machine

TUBING up to 7 feet in length will be honed at the Show by the horizontal machine shown in Fig. 1, which will form part of the exhibit of the Barnes Drill Co., 814 Chestnut St., Rockford, Ill. This type of machine is built for handling tubes and cylinders of diameters and lengths that cannot be honed conveniently on vertical machines. Cradles of various diameters can be supplied to suit the diameter of the hone and the cylinder bore. For example, the machine has been used for honing hydraulic cylinders 10 1/4 inches in diameter by 40 inches long. On that particular job, approximately 0.006 inch of stock was removed in ten minutes, floor to floor.

The hone is rotated by a five-horsepower motor, mounted on the carriage. Pick-off gears are included in a transmission case, also attached to the carriage. The cradle is provided with a lateral adjustment which insures accurate entering of the hone into the work at the beginning of each operation. The cradle supports the hone in the withdrawn position. There are push-buttons at the operator's station for starting and stopping the machine, the stroke counter, and the pump, and also for obtaining more or less strokes per minute than the exact number for which the stroke counter may be set under normal working conditions.

The same concern is also planning to show a No. 194 semi-automatic honing machine of the vertical type which is equipped with a rear pilot for the hone, as illustrated in Fig. 2. Through the use of this rear pilot, holes can be finished in small cyl-

inders, round and straight within from 0.0001 to 0.0002 inch. Among the features of this machine are an electrically controlled stroke counter, an upper bushing for the Micromatic automatic hone, and a lower sleeve bushing that is built into the fixture as the rear pilot guide. It is intended that the work be more or less full-floating and the hone guided in the vertical plane so as to insure accuracy.—Booth No. 201

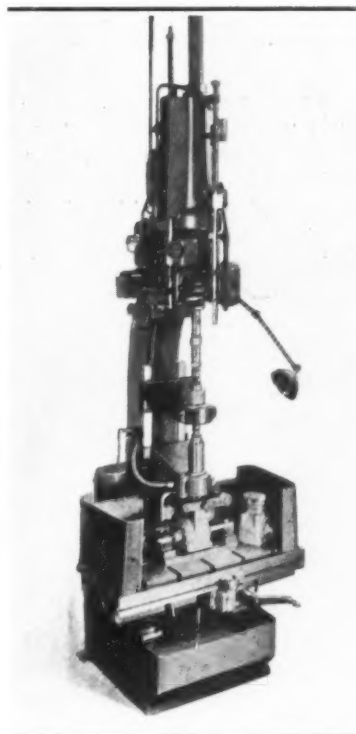


Fig. 2. Barnes Vertical Honing Machine

"Daycoil" Oil-Proof V-Belts

AN oil-proof V-belt developed for general industrial use will be exhibited by the Dayton Rubber Mfg. Co., Dayton, Ohio. This new belt will be marketed under the name of "Daycoil." Its principal field of application will be the machine tool and other industries where excessive oil in connection with power transmission has long been a problem.

This belt has been subjected to exhaustive tests in both laboratory and shop. The saturated or submerged test was employed, in which the belt was actually run dripping with oil while operating at the full rated load. The belt showed no signs of swelling, stretching, or wearing after hundreds of hours of testing in this manner.—Booth No. A-504

During the period of the great industrial development in the United States, industry has not only created production machinery to a hitherto undreamed of degree, but has also absorbed a constantly increasing share of workers and provided more and more jobs.



Wesson Cemented-carbide Tool Lapping Machine with Reversible Motor

Lapping Machine for Cemented-Carbide Tools

A SELF-CONTAINED machine for lapping cemented-carbide tools will be shown by the Wesson Co., 1050 Mount Elliott Ave., Detroit, Mich. This machine weighs 900 pounds and is claimed to be so accurately balanced that it need not be strapped down to the floor. The ball-bearing spindle is driven by a 3/4-horsepower reversible motor.

The reversible feature enables the operator to use both sides of the wheel more effectively. The pump for the cutting lubricant is reversible. Both wheels have adjustable guards which serve also to prevent spraying of the lubricant.—Booth No. A-209

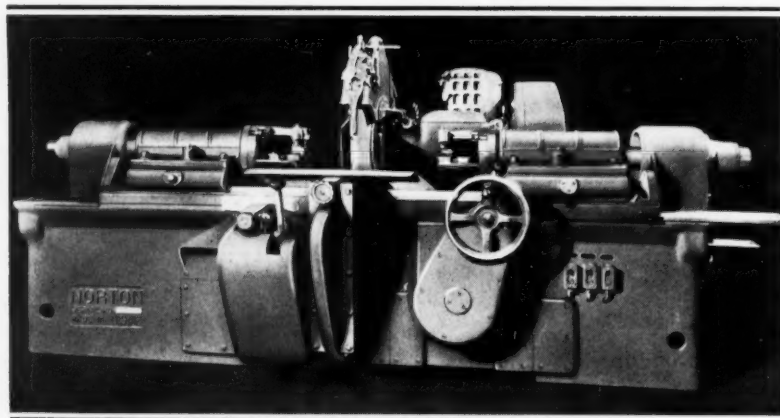


Fig. 1. A Hydraulically Operated Steadyrest is a Feature of the New Norton Crankpin Grinder

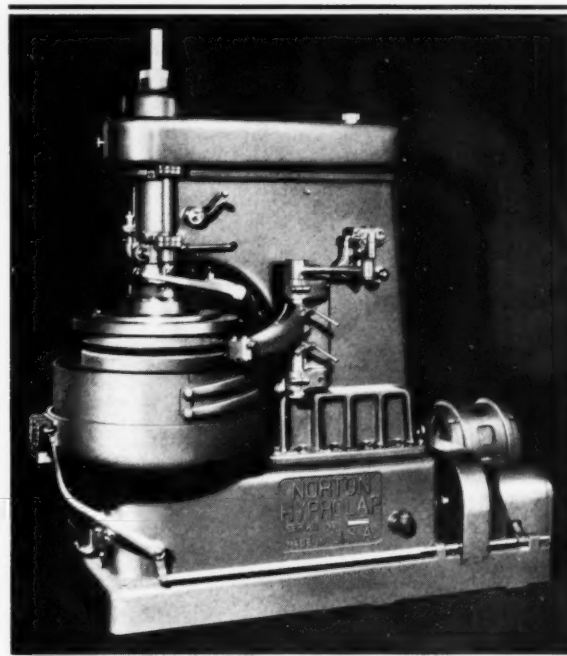


Fig. 2. Norton Machine that Laps Flat and Cylindrical Work on a Production Basis

Norton Crankpin and Camshaft Grinders

A NEW machine for grinding automotive crankpins, built by the Norton Co., Worcester, Mass., is shown in Fig. 1. Only two levers and one handwheel are required to operate the machine. One lever controls the work rotation, the opening and closing of the work-holders, the rapid and slow traverse of the wheel unit up to or away from the work, and the rapid movement of the table from one pin to another. The other lever is used for "jogging" the table to bring the pin being ground in line. The handwheel feeds the grinding wheel into the work. The size is obtained by the use of gage.

A feature of the machine is the

"Lo-Rest," a hydraulically operated steadyrest that automatically drops clear of the work when moving from one pin to the next. A patented arrangement makes the work-holders stop automatically in the loading position.

The controls are interlocked, making it impossible for the operator to move the table by power while the work is rotating or the wheel unit is at the inner position; also, the work-holders cannot be opened while rotating. Three motors are used—one for driving the wheel unit; one for the coolant pump and the oil-pump that operates the hydraulic mechanism; and one for driving the work.

The Norton "Cam - O - Matic," Fig. 3, automatically and successively grinds each cam on a camshaft, trues the grinding wheel, and stops the machine, ready to be reloaded. All the operator does is to load the machine, press a push-button, and move one lever, which starts the automatic cycle.

The machine is electrically controlled and hydraulically operated. A timing unit causes each cam to make exactly the same number of revolutions in contact with the grinding wheel, and the latter to leave the work upon completion of grinding, at the nose of the cam. Upon completing the predetermined number of revolutions, a limit switch is operated, the grinding wheel recedes

rapidly from the work, the table moves quickly to the next cam, after which, with the correct master cam in contact with the master cam roller, the grinding wheel again moves rapidly into contact with the work. In sizing, the grinding wheel always feeds to a positive stop, assuring accurate duplication of work. The wheel of the machine reciprocates during grinding, but this action stops automatically when the grinding wheel is being trued.

Fig. 2 shows the "Hyprolap," a new hydraulically operated lapping machine designed for the high-production lapping of flat and cylindrical work. The features of this machine are pointed out on page 8 of this number of MACHINERY.—Booth No. 101

H & G Threading Machine

THE Eastern Machine Screw Corporation, 23-43 Barclay St., New Haven, Conn., has designed a new threading machine to supplement the standard H & G type. While it occupies the same small floor space as the earlier machine—20 by 36 inches—it handles much larger work.

The machine is so designed that various types of tailstocks or slides can be used to accommodate differ-

ent kinds of second-operation or chucking work. The illustration shows the Model 2 machine, equipped with variable-speed drive and all motor driven. The variable speed is obtained through a New Departure "Transitorq" unit in the base, driving the spindle directly through a silent chain. A simple turn of a hand-wheel provides any die-head speed from 70 to 500 revolutions per minute. A constant-speed motor-driven pump maintains a uniform flow of cutting oil. This machine is also available with countershaft drive and with gears for three speeds, or with simple motor drive and three speeds.—Booth No. 900

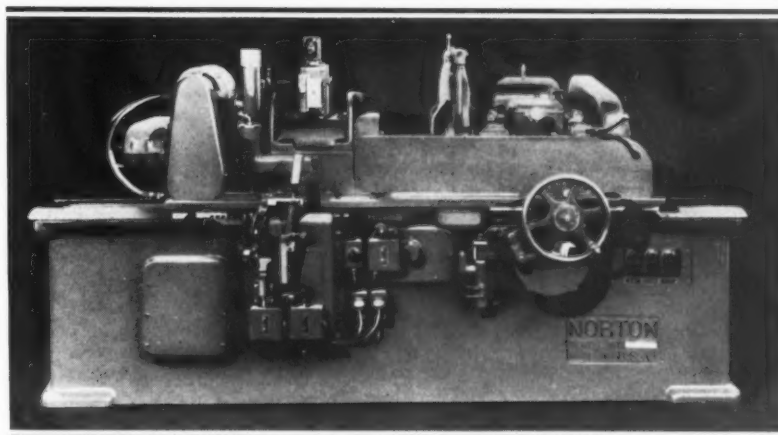


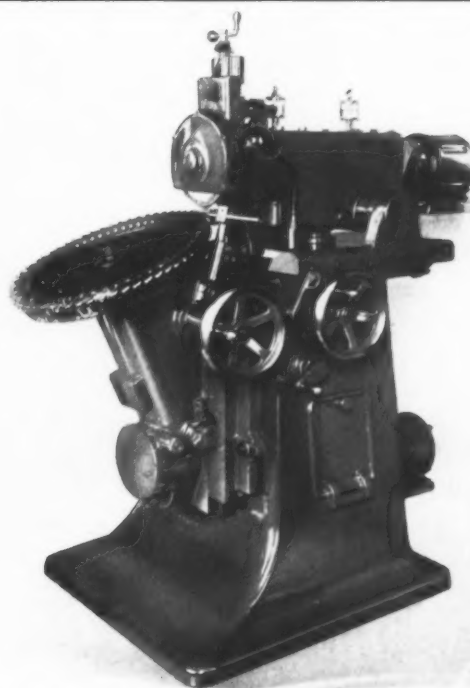
Fig. 3. The Norton "Cam-O-Matic," which Automatically Grinds Each Cam of Camshafts in Succession

Oliver Face-Mill Grinder

THE teeth of face mills are sharpened entirely automatically in a machine to be shown by the Oliver Instrument Co., 1410 E. Maumee St., Adrian, Mich. The cutter is mounted on a spindle which is mechanically indexed to bring each tooth under the grinding wheel, where the tooth is held in the proper relation to the wheel by means of a lip rest. This rest is attached to a ram which carries and reciprocates the wheel. No indexing plates are required, the adjustment for various



H & G Threading Machine with "Transitorq" Variable-speed Drive



Oliver Grinder which Sharpens Face Milling Cutters Automatically

numbers of teeth in the cutter being made in the index mechanism.

The form of the tooth produced is controlled by a hardened cam which may be varied to suit the cutter. In grinding a cutter having tungsten-carbide inserts, the grinding wheel cannot load because, with each reciprocation, it passes over a diamond dresser that keeps it properly formed

and sharpened. This provision for dressing the wheel avoids the necessity of backing off the carbon steel blade of such cutters.

Two speeds of operation are provided, 15 strokes per minute for roughing and 7 1/2 strokes per minute for finishing. All shafts are mounted in ball or roller bearings.—*Booth No. 208*

Blanchard Surface Grinding Machine

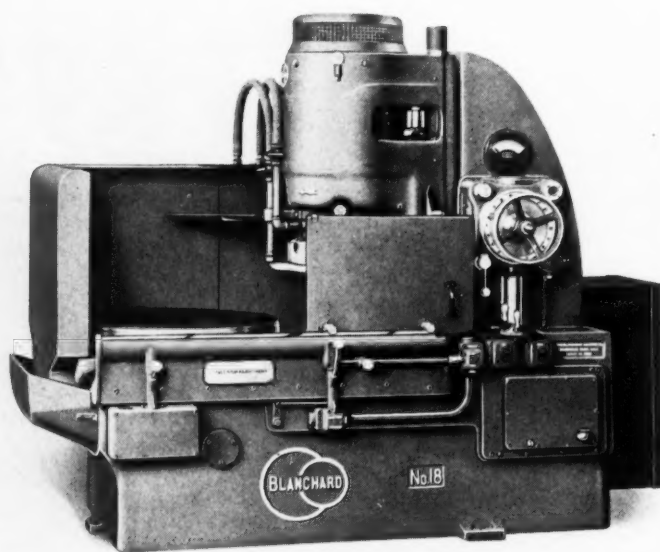
A NEW No. 18 surface grinder will be exhibited by the Blanchard Machine Co., 64 State St., Cambridge, Mass. This machine is similar in size to the No. 16 grinder, but is of new design, with improvements and features that make it faster, more accurate, and easier to operate. Among the important new features are: Power traverse for chuck; water guards that are open at the front; chuck face that is made lower for easier handling of work; increased rigidity of spindle and main members of machine; individual motor drives for table traverse, head raising and lowering, chuck rotation, and operation of water pump.

The feeds range from 0.004 to 0.080 inch per minute. There is an accurate feed-stop for feeding any distance less than 0.100 inch, and a "quick stop" for the spindle. The base has a three-point bearing on the floor.

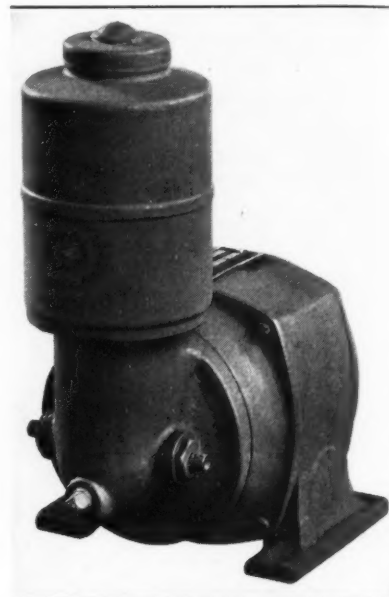
This machine has an 18- by 5- by

15-inch grinding wheel and a magnetic chuck 26, 30, or 36 inches in diameter. The work height under a new wheel is 12 inches in all cases. An over-size 20-inch wheel can be used. The work height can also be increased if required.

The one-piece steel magnetic chuck is driven through a sliding gear-box which gives six speeds ranging from 6 to 33 revolutions per minute, from a direct-connected motor with push-button control. The feed handwheel, which makes one turn for a feed of 0.025 inch, has a dial which makes one turn for 0.100 inch of feed. This dial carries the feed trip and has a quick-setting device by which it can be unlocked from the feed-shaft and set to automatically trip at any amount of down feed less than 0.100 inch. The lever that engages the feed also controls the rapid raising and lowering of the head, the two motions being interlocked.—*Booth No. 309*



Blanchard Surface Grinder with Power Traverse for the Chuck



Pumping Unit for Farval Lubricating System

Farval Lubricating System for Machine Tools

A NEW automatic centralized system of lubrication, designed particularly for use on machine tool equipment, will be exhibited at the Show by the Farval Corporation, 3250 E. 80th St., Cleveland, Ohio. The new system, known as the Type C, consists of a compact fully enclosed pumping unit and valves for controlling the amount of lubricant delivered to the bearings. The valves are of the piston displacement type and are located at the bearings, each bearing having a valve of a capacity to meet its individual needs.

An adjustable timer accurately governs the operation of the lubricator, whether the correct frequency is five minutes or two hours.—*Booth No. A-105*

With constantly reduced prices of automobiles, costs had to be reduced; and with competition extremely keen, quality had to be improved. These two objectives the automobile industry could obtain in one way only—by the installation of improved shop equipment.



*Purolator with Filtering
Capacity of 24.8 Gallons
per Minute*

Double-Type Filter for Industrial Application

A DOUBLE-CASED Purolator will be exhibited by Motor Improvements, Inc., 365 Frelinghuysen Ave., Newark, N. J. This new Purolator is especially adapted for use with coolants and cutting oils.

This type of filter can be furnished for use in series, to give two stages of filtration through the double unit, or for use in parallel, to increase the capacity. These double-cased filters range in size from 7 1/2 to 10 inches in width and from 9 5/16 to 11 7/16 inches in depth. They are designed to operate under a maximum working pressure of 100 pounds to the square inch. The filtering slots may vary from 0.0005 to 0.015 inch. The surface is kept clean by movable knives.—Booth No. A-402

*Much of the machinery in
American plants today
is obsolete because of the
development of new types
which will produce so
much more rapidly than
the older equipment that
a manufacturer cannot
profitably use the old in
competition with the new.*

Farrel-Sykes Improved Gear Generating Machine

IMPROVEMENTS that enhance the accuracy of the product, increase the output, and facilitate operation have been incorporated in the latest type of gear generating machine brought out by the Farrel-Birmingham Co., Inc., 377 Vulcan St., Buffalo, N. Y.

The following improvements may especially be noted: The latest type of cutter relief mechanism not only permits high operating speed, but also improves the accuracy and finish of the work and makes it possible to perform other machining operations besides gear cutting. This mechanism automatically withdraws the cutters during the return stroke.

The helical guides are of entirely new design. In place of one groove and one shoe in each guide, two are now provided. A new automatic in-feed or depth-feed mechanism has been developed which automatically feeds the work toward the cutters in any desired increment per revolution

of the work, and these increments may be uniform or variable, as required. Deep roughing cuts and fine cuts can be made automatically and of any depth desired without the need of a cam or any special attachment. The machine is fully automatic except for setting up and changing work.

The gear- and feed-box have been combined into one unit and the number of gears in the train reduced. A pair of gears has been introduced between the change-gears and the main indexing worm to prevent binding when the worm is lifted for truing up the work.

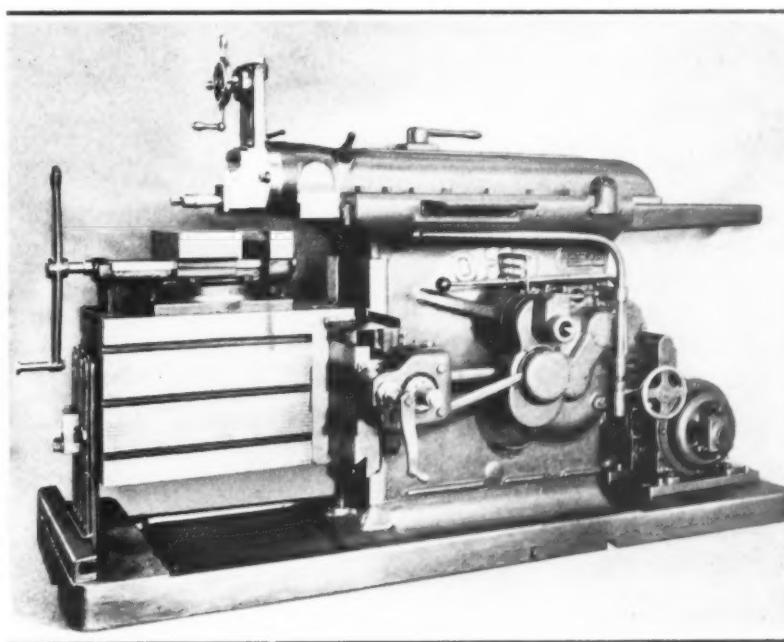
These machines will cut herringbone gears with continuous teeth, having sharp apices, as well as any other type of herringbone gear, single helical gears, and straight-tooth gears with external or internal teeth, spline shafts, cluster gears, sprockets, angle gears, and other tooth forms and contours.—Booth No. 105-A

Ohio Universal "Perfection" Shaper

THE Ohio Machine Tool Co., Kenton, Ohio, will exhibit a 32-inch "Perfection" shaper with a vee ram, embodying several improvements, including a new feed-box; stroke adjustment dial with automatic lock; and new automatic compensating jack.

The company will also show a 16-

inch universal table on a stand—a new type with a double tilting top; a new heavy-duty rod brass attachment for railroad applications; and a new shoe and wedge chuck. The Ohio Machine Tool Co.'s equipment is distributed nationally by the Bryant Machinery & Engineering Co., Chicago, Ill.—Booth No. 13

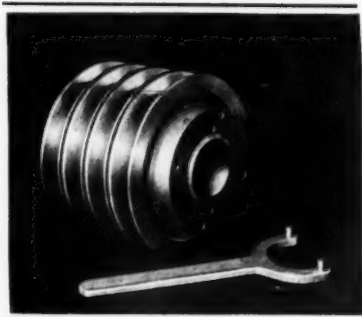


Ohio Universal Shaper Embodying a Number of New Features

Allis-Chalmers "Vari-Pitch" Sheave for Variable-Speed Texrope Drives

THE new "Vari-Pitch" sheave to be exhibited by the Allis-Chalmers Mfg. Co., Milwaukee, Wis., permits varying the speed of Texrope drives. The pitch diameter adjustment of the sheaves enables the speed to be varied from 15 to 25 per cent when one Vari-Pitch sheave is used. When both sheaves are of this type, the variation in the speed range is doubled. The sheaves are made in two multi-groove types, one being adjustable when the drive is stationary, and the other being adjustable for speed control while the sheaves are in motion. Standard Texrope belts are used with these sheaves.

A full line of motors for various machine tool applications will also be shown, particularly the Allis-Chalmers "Seal-Clad" squirrel-cage motor in sizes up to 25 horsepower,



Sheave for Texropes which can be Adjusted for Pitch Diameter

featuring the Bakelite shields used for protecting the windings. The sliding vane principle of the rotary compressor will be demonstrated, and the compact type SSU motor pump will be shown.—Booth No. E-401

Madison-Kipp Presents a New Die-Casting Machine

A MODEL No. 6 die-casting machine, intermediate in size between the Kippcasters built by the Madison-Kipp Corporation, Madison, Wis., and the large automatic machines built by that concern, will be introduced at the Show. The new machine will handle all of the standard die-casting alloys. It is equipped with an air-pressure gooseneck, but a plunger type of gooseneck can be applied. The metal pot has a capacity

for 300 pounds of zinc alloy, while the effective capacity of the standard air-pressure gooseneck is 5 pounds of zinc alloy.

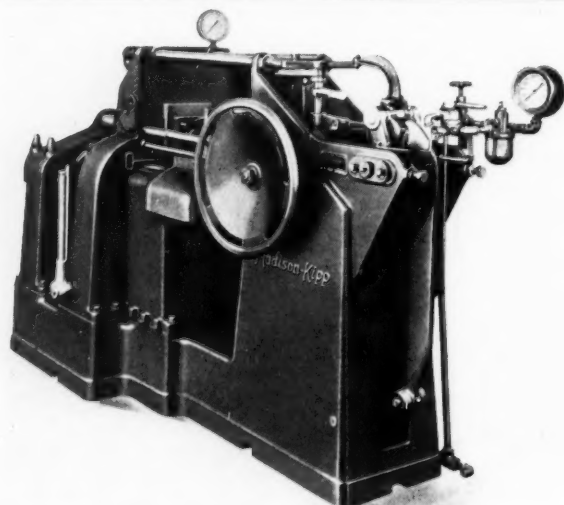
This Model No. 6 machine retains many of the features that characterize the other die-casting machines built by the concern, and in addition, is equipped with a Geneva mechanism for quickly moving the complete furnace assembly and for changing pots and goosenecks where there

is a change in metal specifications.

The speed at which the machine can be operated depends almost entirely upon the rate of solidification that can be maintained on a job. Solidification is facilitated by the use of water-cooling channels in the dies. The standard automatic core-pulling mechanism can be applied. Safety features insure that the metal cannot be shot into the die until the die halves are closed and locked. The main support column of this machine is cast integral with the base. The weight is 3500 pounds.—Booth No. E-208

Henry & Wright 50-Ton Dieing Machine

A MACHINE designed on the same principles as have been applied by the company in its line of dieing machines for several years, but embodying many recent improvements and differing decidedly from earlier models, will be exhibited by the Henry & Wright Mfg. Co., Hartford, Conn. This machine, Fig. 1, is an automatic, high-speed power press equipped with an automatic double-roll feed, a direct-connected motor drive, and a heavy-duty adjustable scrap cutter. It produces stamped metal parts complete at each stroke of the machine, operating at high speed. The capacity of the machine is 50 tons. The roll feed handles material up to 12 inches in width, with a maximum feed pitch of 8 5/8 inches. The scrap cutter, of a recently improved design, automat-



Madison-Kipp Die-Casting Machine with Either Air-operated or Plunger Type Goosenecks

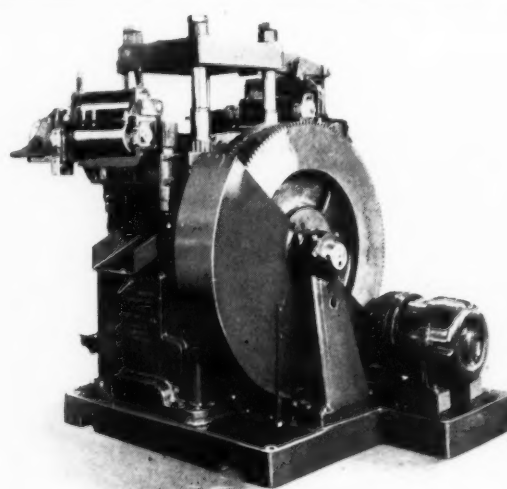


Fig. 1. Henry & Wright Dieing Machine with a Capacity of Fifty Tons

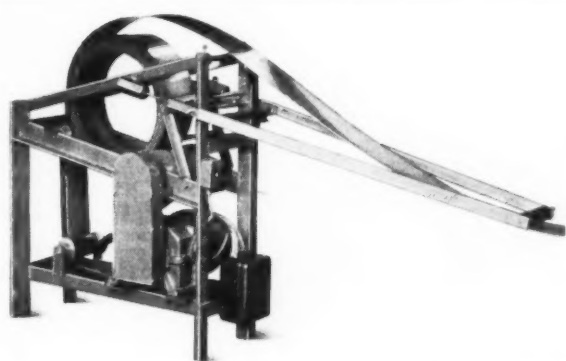


Fig. 2. Stock Reel which is Automatically Controlled by a Mercury Switch and Motor Drive

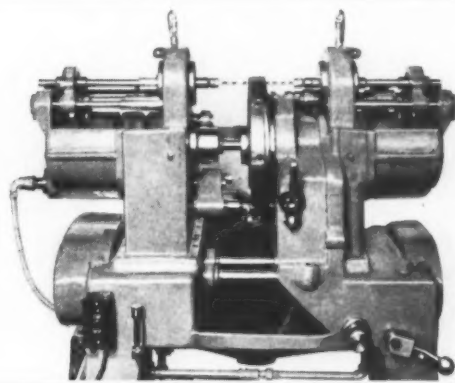


Fig. 1. Buhr Two-way Drilling Machine for High-production Operations on Small Parts

Buhr Two-Way Drilling Machine and "Hydroscru" Power Unit

ically cuts the material into lengths equal to the feed pitch.

One of the features of the Henry & Wright dieing machines is the novel guiding principle employed. The angular thrust of the crankshaft is taken by a cross-head or ram guided in the base of the machine. This cross-head actuates an upper cross-head or punch-carrying member by means of four steel rods, guided at the die bed by adjustable taper bushings. Thus the punch-carrying member is pulled downward with a straight vertical motion.

The company is also exhibiting a new automatic motor-driven stock reel of the cradle type (Fig. 2), permitting material to be dropped into a cradle instead of being mounted on a spindle. This method is advantageous when heavy coils are to be handled. The motor is controlled by a mercury switch actuated by a balanced arm resting on the material between the coil and the roll feed of the press. This control stops the motor before the material is fed out far enough to touch the floor. It also starts the motor before the material is pulled tightly between the press and the coil. Hence the reel operates without attention from the operator.—Booth No. E-308

A TWO-WAY drilling machine designed for the high-production drilling of carburetor parts, small electrical parts, cotter-pin holes in bolts and clevis pins, and similar operations will be shown by the Buhr Machine Tool Co., Ann Arbor, Mich. This equipment is loaded, indexed, checked, and unloaded automatically. In Fig. 1 the machine is shown with the hopper removed, equipped for drilling a cotter-pin hole through a 3/8-inch bolt and for countersinking the hole from both sides. If the hole is not drilled correctly, the checking device will stop the machine and thus obviate scrap parts. The production is 3600 pieces an hour.

Flexibility and interchangeability are advantages claimed for the "Hydroscru" power unit shown in Fig. 2, which can be used either as a single unit or for two-, three-, and four-way set-ups. The unit can be used in vertical, horizontal, or angular positions, and can be provided with multiple heads. The minimum stroke is 18 inches, and feed changes can be obtained by means of pick-off gears

to make the unit suitable for drilling, reaming, spot-facing, tapping, and similar operations.—Booth No. 308

The real answer to the problem of a simultaneously increased industrial output, increased employment, and a generally higher standard of living lies in a renewed and continued application of more efficient machinery. This is the answer to lower prices without lower wages. There is no other means for attaining it.—

Ralph E. Flanders

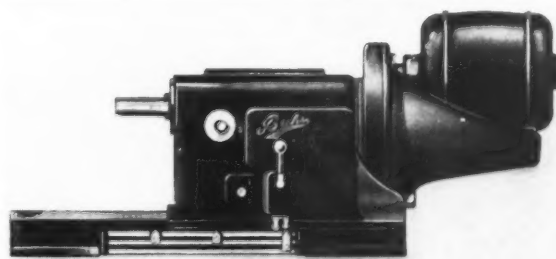


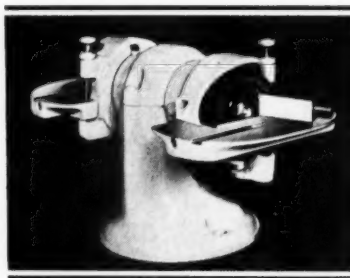
Fig. 2. "Hydroscru" Power Unit for Single or Multiple Use

Prosser Widia Grinders for Cemented-Carbide Tools

A NEW line of moderate-priced grinders for cemented-carbide tools, will be introduced by Thomas Prosser & Son, 15 Gold St., New York City. These machines have been designed to enable the average shop to quickly regrind any moderate-sized tool or tool bit. The line comprises three sizes of grinders, known as Models A, B, and C.

The Model A, which is illustrated, is a light grinder for tool bits up to 5/8 inch square. It has an adjustable-speed, ball-bearing motor. The tables can be set accurately to the angles desired. A combination protractor and diamond-holder is provided as standard equipment. Two 3-inch cup-wheels, one for roughing and one for finishing, are furnished. The finishing wheel may be either a fine silicon carbide wheel or a diamond-impregnated wheel, the machine being fitted with a wick for lubricating the diamond wheel.

The Models B and C grinders have 1/3- and 1/2-horsepower motors, re-



Prosser Widia Grinder for Cemented-carbide Tools

spectively, and are intended for heavier work. The motors are reversible, a feature which permits rough- and finish-grinding of both right- and left-hand tools with the wheel rotating toward the cutting edge. Rough-grinding is done on a straight wheel, a cup-wheel mounted on a steel back being provided for finishing. The adjustable table can be set to obtain the tool angles accurately.—Booth No. E-105

Agrippa Threading-Tool Holder

A THREADING-TOOL holder designed to use a formed cutter, as shown in the illustration, will be presented at the Show by J. H. Williams & Co., 75 Spring St., New York City. This new style of holder is available in two sizes. The maker points out that the high-speed steel formed cutter insures accurate threads, since in resharpener the cutter, it is necessary to grind its top edge only, so that the point always retains the proper form and angle. The cutter is ground to an included angle of 60 degrees, and is backed off to provide proper clearance. A hardened set-screw bears against the rear flat edge of the cutter to provide accurate adjustment.

This concern will also exhibit the non-sparking, non-corroding safety wrenches that were described in August MACHINERY, page 760. These wrenches are drop-forged from beryllium copper, and heat-treated to provide strength, toughness, and hardness.—Booth No. A-410



Fig. 1. Buckeye High-frequency Grinder Available in Two Speeds



Williams Threading-Tool Holder which Employs a Formed Cutter

Buckeye Portable Tools

THE exhibit of the Buckeye Portable Tool Co., Dayton, Ohio, will include the high-frequency grinder shown in Fig. 1, which has been designed with a view of obtaining light weight and power. This tool is available in two speeds—5400 and 8500 revolutions per minute—and is designed to use either 4-inch vitreous or organic bonded wheels and 4-inch buffers.

The company will also exhibit the heavy-duty, high-frequency, electric nut-runner shown in Fig. 2. This equipment is especially intended for assembly work on engines, axles, trucks, tractors, etc. It is provided with a "shockless" clutch, permitting



Fig. 2. Heavy-duty High-frequency Nut-runner

nuts to be driven tight without shock to the operator. It is controlled by a "twist" type switch handle, obtainable for operation in both directions. The machine has a capacity for driving from 1/2-inch to 5/8-inch nuts, and runs at speeds of 300, 500, and 750 revolutions per minute. It weighs 32 pounds.

Another product to be exhibited is a new high-frequency electric polisher, weighing only 10 pounds. This is similar in general design to the grinder shown in Fig. 1. A high-frequency screwdriver, also exhibited, weighs only 7 3/4 pounds and has a capacity for driving No. 12 and No. 14 screws. The speeds available with this screwdriver are 500, 750, and 1000 revolutions per minute.—Booth No. A-407

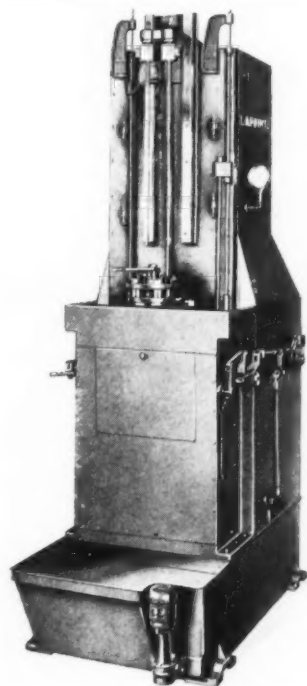
Lapointe Vertical Broaching Machine with Automatic Broach-Handling Feature

ONE of the principal features of a V type hydraulically operated broaching machine to be shown by the Lapointe Machine Tool Co., Hudson, Mass., is that the broaches are handled automatically without any attention from the operator. At the end of the cutting stroke, the work is removed or indexed, as the case may be, and the broaches are quickly lifted to their upper position, out of the way of the fixture. The fixture is then reloaded or indexed, and the broaches are moved downward rapidly until they are automatically engaged in the pull bushings of the main slide, ready to begin the cutting stroke.

The upper ends of the broaches are guided during the cutting stroke until the finished sections are nearly in the work. The upper broach-holders are then released automatically. This method of operation provides a considerably increased production capacity, because the idling time at each end of the stroke is practically eliminated. On the machine shown, universal joint sleeves are broached at the rate of 250 pieces an hour.

Either indexing fixtures or simple fixtures that merely locate the work

may be used. However, when more than one broaching operation is required to complete a part, the indexing type of fixture generally gives greater production. In most cases, the work can be completely submerged in coolant, insuring adequate lubrication of the broaches and thus enabling high cutting speeds to be employed. This broaching machine is built in three capacities of 15, 20, and 25 tons.—Booth D



Broaching Machine with Automatic Broach-handling Feature

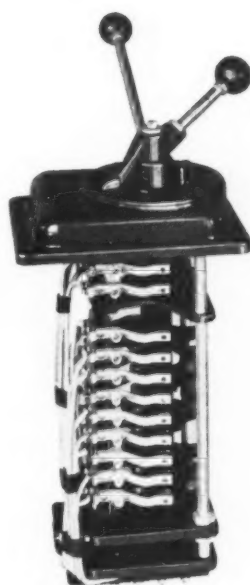


Fig. 1. Euclid Electric Control Used on Turret Lathes

Euclid Electric Control Equipment

AMONG the recent developments of the Euclid Electric & Mfg. Co., Chardon Road, Euclid, Ohio, is a combination of a non-reversing drum type, four-speed selector and a reversing master, Fig. 1. This type of equipment is being used on a well-known line of turret lathes. A magnetic reversing panel with overload protection is used for reversing the main lines. The operating lever for the master has two positions—start and run—in each direction. The lever is thrown on full to start, and when released, returns to the “run” position. In case of overload or voltage failure, the lever must be moved



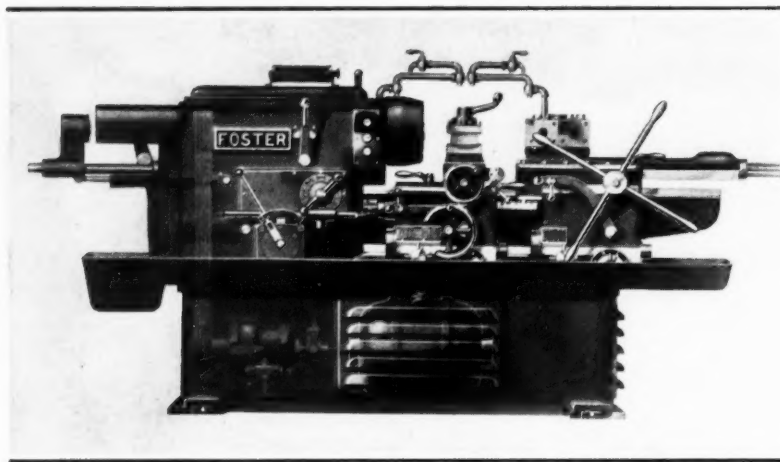
Fig. 2. Drum Type Reverse Switch for Machine Tools

to the start position to reclose the contactor, thus giving overload and no-voltage protection. This equipment is available for ratings up to 10 H.P., 220, 440, and 550 volts.

Across-the-line drum type reverse switches (Fig. 2) for machine tool service, intended for single-phase, polyphase or compound motors, and available in ratings up to 2 horsepower, 220, 440, and 550 volts alternating current, and 1 horsepower, 230 and 550 volts, direct current will also be exhibited. In the drum construction, use is made of stamped steel parts with removable copper drum contacts.—Booth No. A-202

We need not fear high-production machinery. We have never yet, even in a fifty-hour week, produced goods in great enough profusion to provide a decent standard of living for our entire population. The best of modern equipment will have to be built and installed and put to work on an enormous scale, if the desired standard of living is to be realized with a forty-hour week.—

Ralph E. Flanders



New Foster Machines at the Show

HYDRAULIC power is used to operate the automatic chuck and bar feed of a motor-in-base universal turret lathe which will be one of the exhibits of the Foster Machine Co., Elkhart, Ind. This machine, which is illustrated in Fig. 1, is available in three sizes having a round bar capacity of 1 1/2, 2, and 2 1/2 inches. When the hydraulic valve lever of these machines is moved in one direction, the collet is opened and the bar stock is fed forward against a stop. When the lever is moved in the reverse direction, the collet is closed and the bar feed-head is moved back along the bar to be in position ready for the next forward movement. This hydraulic feature greatly reduces fatigue of the operator.

Sixteen spindle speeds, all dial-selected, are available. The cross-carriage is fully universal, having both cross and longitudinal feeds. The hexagon turret is unclamped, indexed and reclamped by the backward and forward movements of the turret-slide. The machine is built to take full advantage of the new cutting alloys.

The regular automatic chuck capacity of the No. 1 screw machine shown in Fig. 2 is 13/16 inch, but it can be increased to 1 1/16 inches. Eight spindle speeds ranging from 300 to 3600 revolutions per minute, dial-selected, are available on this machine. However, different spin-

dle-speed ranges can be provided. This machine can be arranged with either a hand- or a cam-operated

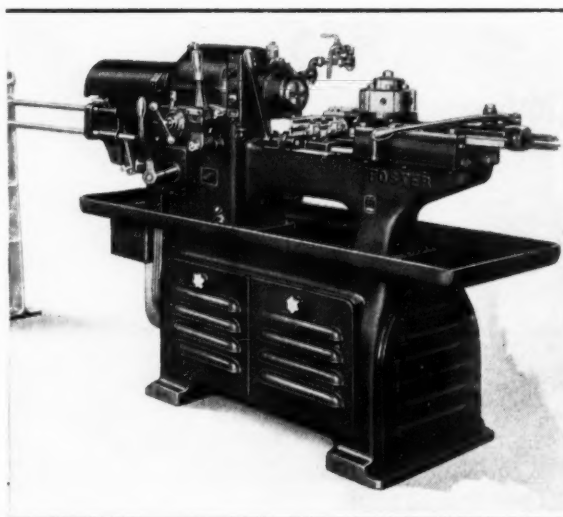


Fig. 2. Screw Machine which Provides the High Spindle Speeds Demanded Today

automatic chuck and bar feed. The turret of this machine is also automatically unclamped, indexed, and

Fig. 1. Foster Turret Lathe with Hydraulic Chuck and Bar Feed

reclamped with the backward and forward movements of the turret-slide.

One of the features of the No. 3 indexing turret Fastermatic shown in Fig. 3 is the nitrided V-ways, having a hardness greater than 1000 Brinell, with which it is provided. There are sixteen spindle speeds arranged in four sets of four automatic changes each. Any group of automatic changes can be selected through levers, after which the changes are made by the forward movement of the turret unit. If desired, the four spindle-speed changes can be automatically made with one forward movement of the turret or they can be made as each face of the turret is moving forward. A hydraulic

arrangement provides a separate feed for each face, and the feed can be converted into a rapid traverse at any point. This Fastermatic is built in four sizes, and in the platen type, as well as in the indexing turret type shown.

The concern will also show a No. 7 universal turret lathe of the ram type, which has a bar capacity of 2 1/2 inches. The spindle speeds of this machine are hydraulically controlled and can be obtained while the spindle is in motion by merely turning a dial. The automatic chuck and bar feed of this machine are also hydraulically operated, and nitrided V-ways are supplied for the bed. Nine power feeds are available through one dial on the apron; these can be doubled

by moving a lever at the head end of the machine, thus providing eighteen feeds.—Booth No. 200

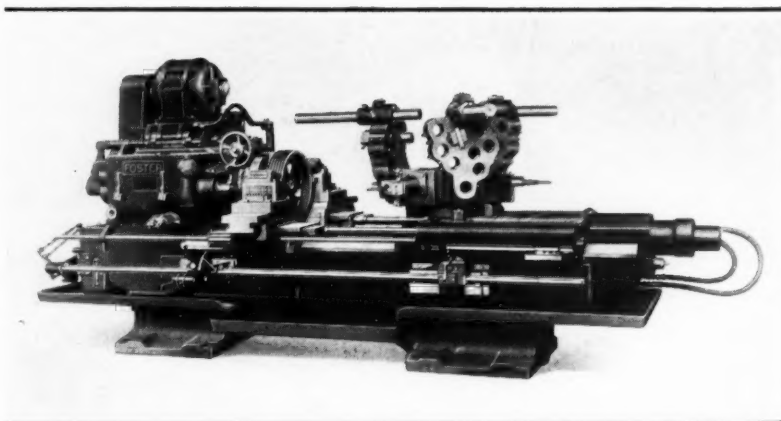


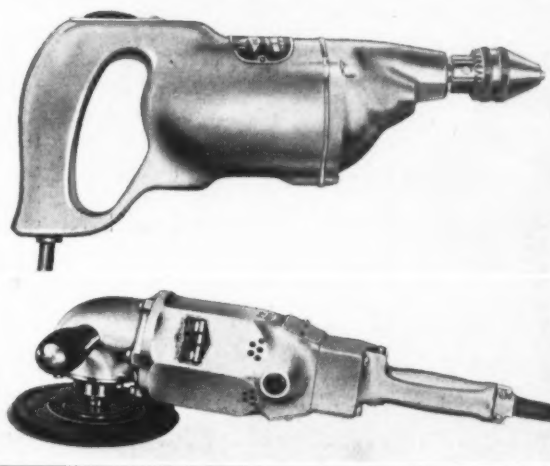
Fig. 3. New Fastermatic with Hydraulic Feed and Rapid Traverse

Electric Tools with Increased Power and Lighter Weight

NEW electric tools with increased power and lighter weight will be exhibited by the Black & Decker Mfg. Co. and the Van Dorn Electric Tool Co., Towson, Md. In addition to their complete industrial tool line, these companies will display a practically new line of high-cycle portable tools, including 180-cycle screwdrivers, nut-runners, grinders, sanders, and drills.

The new products include a 7-inch "Super-Service" sander and a 1/4-inch Junior drill. The 1/4-inch drill has a slide switch on the top of the easy-grip handle, which can be controlled by the thumb.

The 7-inch "Super-Service" sander is intended for heavy-duty sanding and metal finishing. The commutator



Two New Tools in the Black & Decker and Van Dorn Exhibit

and switch compartments of this sander are sealed to prevent the entrance of abrasive dust.

The two new high-cycle right-angle screwdrivers are production tools adapted for numerous screwdriving and nut-running applications. Four radial positions for each tool permit work to be done in close corners. The No. 1 unit has a capacity for driving 3/16- and 1/4-inch bolts and No. 8 screws, while the No. 2 unit is adapted for driving 1/4- and 5/16-inch bolts. Both units have an adjustable clutch for obtaining uniform driving torque.

The four new high-cycle right-angle nut-runners have clutches which can be adjusted for uniform tension and which are adaptable to light or heavy work. The four sizes of nut-runners have capacities covering a range of bolts from 5/16 to 11/16 inch.

There will also be a new 2-inch, high-cycle die-grinder, and a new 4-inch grinder.—Booth No. E-101

Ahlberg Pillow Blocks for Ball Bearings

IN addition to its complete line of bearings and bearing housings, the Ahlberg Bearing Co., 321 E. 29th St., Chicago, Ill., will exhibit for the first time at the Show a newly developed line of CJB pillow blocks. These pillow blocks are available in the unit type for normal and medium duty. The ball-and-socket type is available for standard and heavy-duty work. This provides two distinct types, in addition to the present EC or light-duty type, which permits a selection of nine capacities for a given shaft size and four additional capacities for each standard metric shaft diameter.

The standard and heavy types are made with a ball-and-socket type housing, which permits the installation of a heavy-duty rigid type, double-row ball bearing and includes features that compensate for variations in the alignment of the base and shafting. The standard and heavy types have a patented method of drawing the bearing on the adapter which facilitates the location and fixing of the bearing on the shaft with-

out having to open the pillow block.

The medium-duty straight-bore type of bearing can be mounted directly on the shaft. The medium-duty type, when employed for exacting application, utilizes a countersunk shaft arrangement for locking the bearing to the shaft. The heavy-duty tapered-bore type is designed for mounting on standard shafting and compensates for a normal amount of variation in tolerances.—Booth No. E-301

Destroy efficiency by using obsolete machinery, and wages and consuming power will go down with it. Keep up the efficiency of equipment and methods, and the result will be more employment, higher wages, and prosperity for all.



Ahlberg Pillow Blocks Fitted with Different Styles of Ball Bearings

Kearney & Trecker Light-Duty and High-Speed Milling Machines

VISITORS to the booth of the Kearney & Trecker Corporation, Milwaukee, Wis., will find a wide variety of new milling machines, as practically every machine in the entire line of Milwaukee knee-and-column type millers has either been recently redesigned or replaced by a new model. Perhaps the greatest interest will be centered around a No. 0 size Model H manufacturing machine of the knee type, which has been designed primarily for the quantity production of small parts such as are required in the manufacture of typewriters, calculating machines, radios, etc. The distance from the center of the spindle to the floor on this machine is only 3 feet 8 inches. Sixteen spindle speeds are obtainable through the quick-change gear-box in ranges of 20 to 800, 50 to 2000, or 60 to 2400 revolutions per minute, while sixteen feeds are available in ranges of 1/4 inch to 10 inches, 1/2 inch to 20 inches, or 1 1/2 to 60 inches.

To meet the requirements of light milling in general manufacture or in the tool-room, there is a new line of No. 2H light machines, which are furnished in plain, universal, and vertical types. These machines are

driven by a three-horsepower motor. Sixteen quick-change speeds are available in ranges of 20 to 800 or 50 to 2000 revolutions per minute, and there are sixteen quick-change feeds obtainable through a single dial control. The feed ranges are the same as on the No. 0 machine.

The "DeLuxe" line of Model K high-speed wide-range knee type machines has been redesigned to incorporate a number of new features. One of the principal new features is a duplicate front and rear control for both hand adjustment and power-feed operation. Twenty-four spindle speeds are available in one continuous series in approximate geometric progression without any speeds overlapping.

Speed selection is made at the left-hand side of the column with a single lever and a large direct-reading dial, both of which may be seen in Fig. 2. Speeds from 15 to 1500 revolutions per minute are provided on both the Nos. 2 and 3 machines. Thirty-two feeds are available in one continuous series through a single lever and a direct-reading dial. Feeds range from 1/4 inch to 60 inches per minute, and they can be changed while the spindle is revolving.

The worm-gear drive formerly provided for the spindle has been replaced with spur gears that are ground and lapped to give an equally quiet drive. The start-and-stop push-button control has been removed from the side of the column and placed on the starting lever.

For the most exacting work of the tool-room and experimental laboratory, there will be shown a Model K hypoid bevel-gear dividing head, which is equipped with preloaded anti-friction bearings and has a 5 to 1 quick-indexing arrangement. For work that does not require a wide range or great versatility, there is a new Model H dividing head of the worm and worm-wheel type having a ratio of 40 to 1.

A new attachment of unusual interest that will be shown is an astronomical divider for divisions from 2 to 1,296,000. It will divide into one second of an arc. There will also be a new cam-slide which will convert a Model K universal machine into equipment for producing cams in quantities. Straight or tapered threads can be cut on universal machines by means of a thread-milling attachment that will be shown. The concern will also exhibit bed type milling machines with a hydraulic feed, as well as a grinder for sharpening tungsten-carbide face mills.—
Booth No. 400

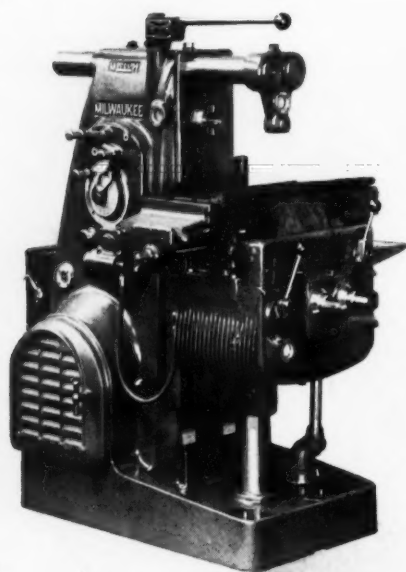


Fig. 1. Kearney & Trecker Model H Milling Machine Built in Various Sizes for Light Duty

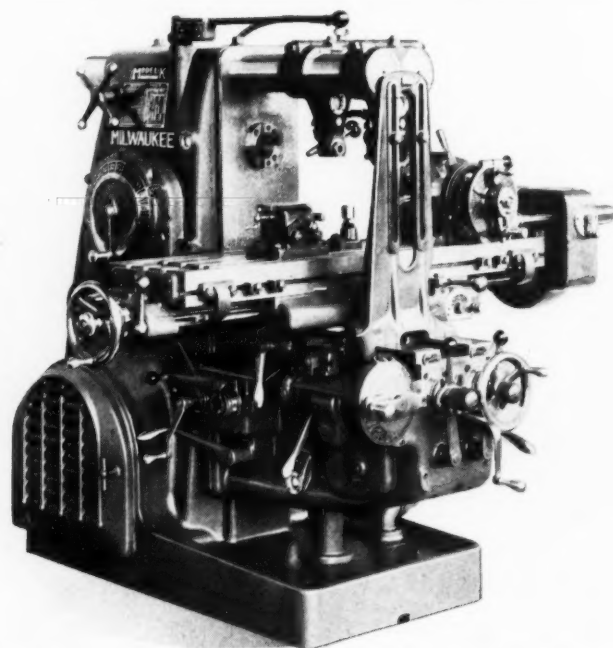


Fig. 2. Model K High-speed Milling Machine with a Duplicate Front and Rear Control for Hand Adjustment and Power Feed

A Cincinnati Roll Grinding Machine with Important Improvements

AMONG the exhibits of the Cincinnati Milling Machine and Cincinnati Grinders, Inc., Cincinnati, Ohio, will be a roll grinding machine in which a considerable number of improvements have recently been incorporated to make it simpler to operate and to enable it to produce more accurate work and a higher quality of finish. The machine is built in swings of 20, 24, and 28 inches, and with center distances up to 192 inches. It has a capacity for roughing chilled alloy-iron rolls and for sensitive finishing to close limits of accuracy.

Wheel truing is performed independently of any other machine movement, a hydraulic cylinder supplying the power for traversing the diamond across the wheel. The arrangement is similar to that provided on standard Cincinnati centerless grinders. The wheel can be trued straight or with a slight crown, as necessitated by the type of roll to be ground.

New radial type spindle bearings increase the accuracy and finish obtainable on work. These bearings possess a long life and do not require

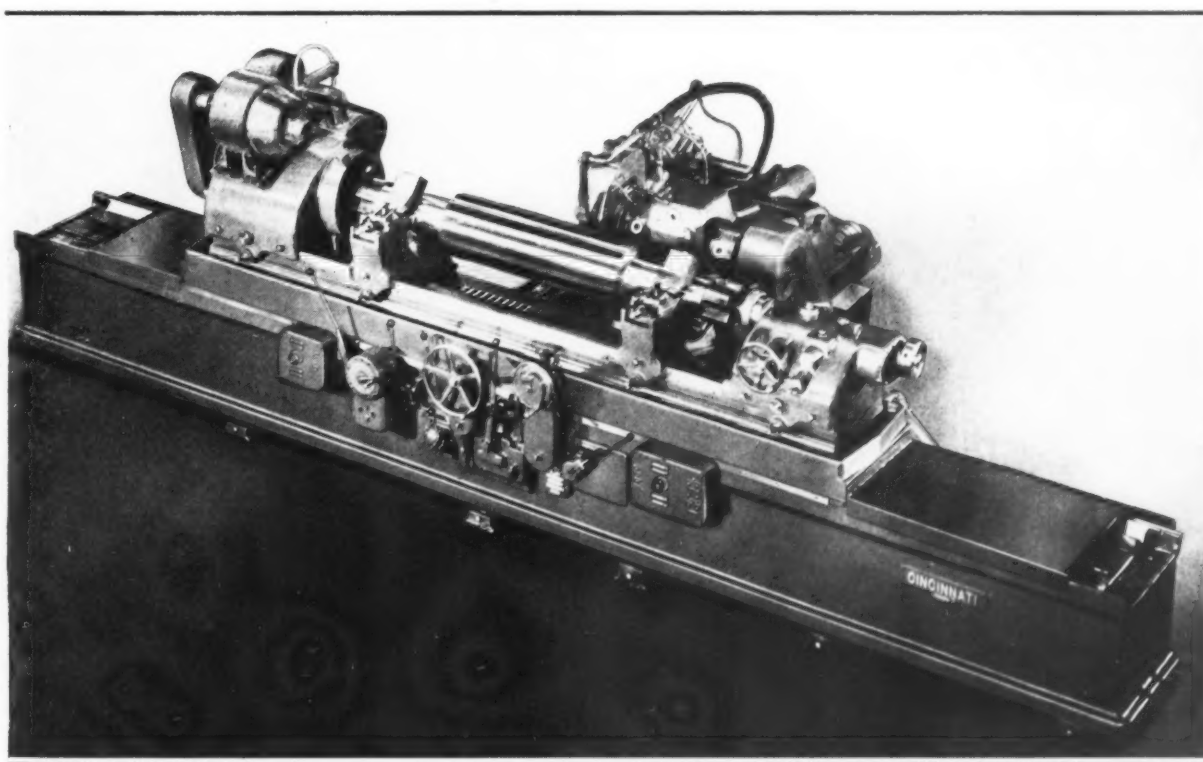
frequent adjustment. It is not necessary to readjust the bearings when changing from the heaviest roughing cut to the lightest finishing grind. Pressure-feed lubrication is supplied to the work and to the table ways. Other features of the machine include a power cross-feed to the wheel-head and a low angle table equipped with a thrust support rack. All electrically controlled buttons are enclosed in two boxes, and all control levers have been compactly grouped.

Bar and cam types of cambering mechanisms are available. The bar type permits the grinding of a large variety of concave and crowned rolls, as well as the finishing of rolls having a number of different curvatures. The bar type of cambering mechanism consists of an auxiliary bed which is bolted to the rear base of the machine and supports a traversing table that carries a camber bar. Motion is transmitted to the camber table by the machine table, both tables being synchronized. Jack-screws enable the camber bar to be set to the desired curvature or a bar of permanent form can be used when only one curve is necessary for all rolls. As the cam-

ber table traverses, the grinding wheel is tilted toward or away from the roll by a shoe on the wheel-head riding on the camber bar.

New set-ups can be easily and accurately made, thus enabling the duplication of work within close limits of accuracy. The setting of the camber bar is a relatively simple operation, as the work is ground to the exact contour of the bar. A close-reading indicator enables the operator to check the amount of camber accurately. Pressure-feed lubrication is provided for the cambering mechanism.

The cam type of cambering device consists essentially of a train of pick-off gears driven by the machine table, a cam mounted on a shaft driven by the pick-off gears, and a trunnion-mounted wheel-head which is operated by the cam. The cam actuates a lever and plunger under the rear end of the wheel-head and causes the wheel-head to tilt toward or away from the work as it rotates, so as to grind the roll to the desired concave or convex shape. The cam and all other parts within the cambering unit are adequately lubricated. A hydraulically operated backlash device that is automatic in action eliminates play from the entire mechanism.—Booth No. 207

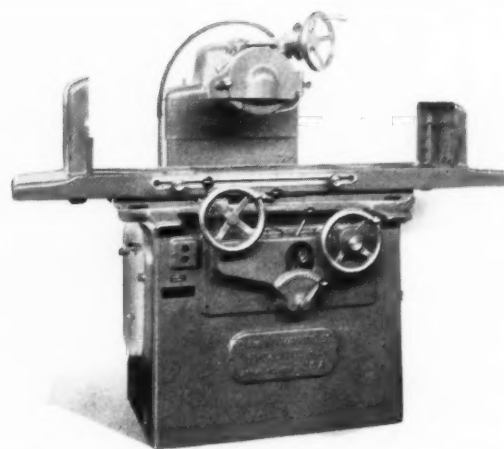


Cincinnati Roll Grinding Machine which Embodies Such Improvements as an Independent Hydraulic Wheel-truing Device and New Radial Type Spindle Bearings that Greatly Reduce the Frequency of Adjustments

Diamond Surface Grinding Machine of Latest Design

THE Diamond Machine Company, 9 Codding St., Providence, R. I., will exhibit a Type G4 surface grinding machine that differs primarily from other machines of the Type G series in the location of the hand-wheels and in its greater flexibility of operation. This machine can be operated at high table speeds because of the hydraulic drive. The cross-feed is also obtained hydraulically, and the table ways are lubricated from the hydraulic system.—Booth No. 605

*Improved Surface
Grinding Machine
Built by the Dia-
mond Machine Co.*



Index of New Equipment at the Exposition

Abrasive Machine Tool Co.'s Surface Grinder.....22	Farrel-Sykes Gear-generating Machines.....64-E	Monarch Engine Lathe.....40
Acme Forging Machine.....11	Farval Lubricating System.....64-D	National Acme Automatic.....36
Ahlberg Pillow Blocks.....64-K	Federal Indicator.....46	New Britain Automatic.....47
Allis-Chalmers Texrope Sheave 64-F	Ford Johansson Gages.....48	Norton Crankpin and Camshaft Grinders.....64-B
American Broaching Machines.....11	Fosdick Drilling Machines.....16	Norton Grinding and Lapping Machines.....8
American Multi-Production Lathe.....54	Foster Turret Lathes.....64-J	Ohio Universal Shaper.....64-E
Arter Grinders.....60	Gallmeyer & Livingston Hy- draulic Surface Grinder.....29	Oliver Face-mill Grinder.....64-C
Baker-Raulang "Hylift" Truck.....29	Geometric Threading Machine.....59	O. K. Tool-holders.....48
Barnes Drill Co. Honing Machines.....64-A	Giddings & Lewis Boring, Drill- ing and Milling Machine.....28	Peerless Metal-sawing Machine.....54
Barnes Drill Co. "Hydrum" Drilling Machine.....17	Gisholt Turret Lathe.....10	Porter-Cable Hydraulic Lathe.....47
Barnes (W. F. & John) Cyl- inder-Block Boring Machine.....15	Gould & Eberhardt Hobber.....12	Pratt & Whitney Jig-Borer.....27
Bausch & Lomb Projectors.....58	Gould & Eberhardt Shaper.....61	Pratt & Whitney Die-sinkers, Gear-grinders, and Keller Automatics.....60
Blakeslee Vapor Degreasers.....30	Goss & DeLeeuw Five-spindle Chucking Machine.....41	Producto-Matic Milling Machine.....48
Black & Decker Electric Tools 64-K	Gray Planer-Miller.....24	Prosser Widia Carbide Grinders.....64-H
Blanchard Surface Grinder.....64-D	H & G Die-heads.....47	Purolator Oil Filter.....64-E
Bridgeport Face Grinder.....30	H & G Threading Machine.....64-C	Reeves Hydraulic Controllers.....62
Brown & Sharpe Milling Machines.....45	Hall Pipe-threading Machine.....57	Rockford Shapers.....42
Brown & Sharpe Surface Grinder.....36	Hanchett Surface Grinder.....52	Rotor Electric and Air Tools.....24
Buffalo Forge Drilling Machine 17	Hannifin Hydraulic Riveter.....59	Seneca Falls Lathes and Centering Machines.....51
Buckeye Portable Tools.....64-H	Harnischfeger Arc Welders.....53	Sundstrand Stub Lathe and Electromil.....39
Buhr Drilling Machine.....64-G	Heald "Bore-Matics".....21	Toledo Scales.....18
Carborundum Grinding Wheels 35	Heald Internal Grinders.....53	Tuthill "Fuelstat".....61
Cincinnati Bickford Radial Drilling Machine.....22	Henry & Wright Press.....64-F	Universal Boring Machines.....41
Cincinnati Roll-grinder.....64-M	Hobart Arc Welders.....30	V & O Notching Press.....16
Cincinnati Lathes.....35	Hoefer Hydraulic Drilling Unit 27	Van Norman Milling Machines.....58
Cleereman Drilling and Tapping Machines.....42	Hutto Honing Machine.....12	Warner & Swasey Turret Lathes 46
Cleveland Model K Automatics 34	"Hydro-Power" Presses.....9	Wesson Carbide Lapping Machine.....64-B
Colt Cleaning Equipment.....10	Illinois Die-filing Machine.....33	Westinghouse Contactors.....23
Dayton Oilproof V-belts.....64-A	Jones & Lamson Turret Lathes.....18	Westinghouse Balancing Machine.....40
Diamond Surface Grinder.....64-N	Kearney & Trecker Milling Machines.....64-L	J. H. Williams & Co., Threading- Tool Holder.....64-H
Euclid Electric Controls.....64-I	Kent-Owens Milling Machines.....28	
Ex-Cell-O Power Units.....62	Landis Threading Machine.....34	
Ex-Cell-O Grinders.....23	Landis Hydraulic Grinder.....33	
	Lapointe Broaching Machine.....64-I	
	Madison-Kipp Die-casting Machine.....64-F	

A Preview of Some of the Additional Exhibits

IN addition to the new machines illustrated and described in the preceding pages, there will be many interesting exhibits at the Show, a few of which are briefly referred to in the following paragraphs:

The booth of the Timken Roller Bearing Co., Canton, Ohio, offers an item of considerable interest in the form of a complete summary of Timken bearing equipped machines on display at the Show. Practically all of the 60 lineal feet of wall space in the booth is devoted to a list of exhibitors of Timken-equipped machines. Bearings ranging from one of the largest ever made for a machine tool down to one of the smallest are also displayed.

At the booth of the Hyatt Roller Bearing Co., Newark, N. J., will be shown, in addition to the regular standard series bearings employing helical rollers, the newer type of Hyatt bearings with solid rollers. A number of full-size assembly drawings, made up into novel transparencies, will demonstrate the application of Hyatt roller bearings in machine tools.

The variable-speed Transitorq, a new gearless transmission, will be displayed by the New Departure Mfg. Co., Bristol, Conn., in addition to the company's line of ball bearings. Transitorqs will be shown in 1/4-, 1-, 3-, and 5-horsepower sizes. One size will be cut open and illuminated in the interior, showing the principle of operation. The Transitorq was described in detail in June MACHINERY, page 624.

The exhibit of the SKF Industries, Inc., Philadelphia, Pa., will feature a specially prepared spindle demonstrating a new principle of roller-bearing mounting for lathes, milling machines, and similar equipment. A complete grinding spindle with a new ball-bearing mounting will also be exhibited, in addition to a complete display of ball and roller bearings.

The Marlin-Rockwell Corporation, Jamestown, N. Y., will place particular emphasis in its exhibit upon the application of ball bearings to various types of spindles, and will have on display a complete line of spindle applications for different types of

machine tools. One type of bearing to be shown is used in high-speed spindles, several of which run at 50,000 revolutions per minute; another is intended for very high preloads, to provide extreme rigidity to spindles for heavy-duty service.

The Cincinnati Milling Machine Co. will show in operation two hydraulic vertical broaching machines equipped as shown in Figs. 1 and 2. The "2-36" machine, Fig. 1, broaches both sides of a boss on automobile front radius-rod supports at the rate of 550 pieces an hour, removing 3/32 inch of stock from each surface. Two fixtures are used, one of which holds right- and the other left-hand pieces. One fixture is loaded while the other is in operation. The "5-42" machine, Fig. 2, broaches the inside faces of the same part. The production is about 515 pieces an hour. The operation of this machine, including the loading and unloading of the fixtures, is similar to that of the other machine.

The entire exhibition of the Cincinnati Milling Machine Co. will include twenty-three machines weigh-

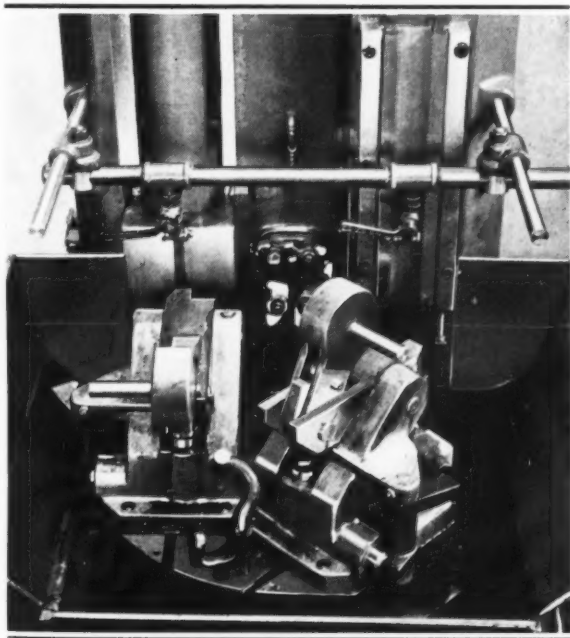


Fig. 1. Cincinnati Duplex Hydromatic Broaching Machine Finishing Bosses on a Forged Automobile Part

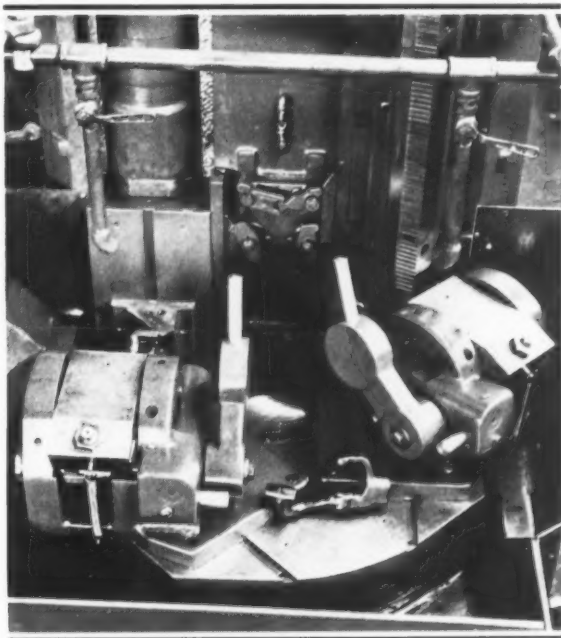


Fig. 2. Machine Similar to One Shown in Fig. 1, but of Larger Size, Performing a Second Broaching Operation

ing, in total, over 250,000 pounds and requiring 275 horsepower for their operation. Many of the machines shown will be of entirely new design. Among the new machines exhibited that have not previously been described in the technical press are a new Hydro-Diematic, a machine for automatically reproducing accurate forms and contours in dies; a No. 1-12 plain automatic milling machine; two sizes of Duplex vertical Hydro broaching machines; a centerless lapping machine; and a universal Type L milling machine.

A practical working display of the application of Timken bearings to machine tools will be found at the booth of the Warner & Swasey Co. where one of the company's standard universal turret lathe spindles has been mounted vertically in Timken tapered roller bearings in a pedestal with two Zeiss Optotest indicators at the upper end. One of these gages, which magnifies the actual reading two thousand times, will be set to indicate the spindle run-out, while the other will indicate "camming" action. It will be shown that the spindle has a run-out of less than 0.0002 inch at any point, and a camming action of less than 0.0002 inch.

The Fellows Gear Shaper Co., Springfield, Vt., will exhibit a number of entirely new machines, including a roughing and finishing gear shaper; an hourglass gear shaper for shaping worms with a new type of gear-shaper cutter; a worm-lapping machine for lapping straight worms after hardening; and a helical cutter sharpening machine with automatic feed.

Among the new tools to be shown for the first time at the Show are the new Zee-Lock cutters made by the Ingersoll Milling Machine Co., Rockford, Ill. This cutter was first designed as a heavy-duty face-milling cutter, but the principle of design is now being applied to several other types of milling cutters, and to boring, facing, hollow-milling, and combination tools. In these cutters, the blade is securely retained in the cutter housing by a Z-shaped wedge which makes it impossible for the blade to shift backward or inward, away from the cut.

The Twin Disc Clutch Co., Racine, Wis., in addition to an exhibit of the company's complete line of CC and BFT clutches that have previously been described in *MACHINERY*, will exhibit an entirely new enclosed type of clutch having many features that

differ from clutches of previous design.

The Logansport Machine Co., Logansport, Ind., will exhibit, in addition to its regular line, a new type of three-jaw chuck having hardened steel jaws, conforming to the new proposed American standards. The company will also exhibit its improved ball-bearing plug type, packless control valves and improved brass-lined steel-tube air cylinders in standard sizes from 1 1/2 to 8 inches.

In the exhibit of the Link-Belt Co., Chicago, Ill., typical lay-outs of silent and roller chain drives for machine tools will be shown. In addition, there will be a motorized P.I.V. gear (a positive, infinitely variable speed transmission) equipped with a tachometer to show the speed variations. A skeletonized P.I.V. gear will be on display to show how the unit can be built into a machine tool. The Link-Belt V.R.D. fractional-horsepower variable-speed transmission will also be on display with a speed indicator. A motorized reducer with a section of the housing cut away to show the operation of the gears will also attract attention.

Cutler-Hammer, Inc., of Milwaukee, Wis., will display representative items from the company's complete line of motor control and accessories for machine tool applications, including standard and custom-built designs for separate mounting and for "building-in." Some of these machine tool controls are displayed for the first time.

The marked progress made in metal cleaning during the last few years will be visualized in a unique display in motion called "A Parade of Industries" at the exhibit of the Oakite Products, Inc., New York City. Hundreds of miniature models of a wide variety of products that require several cleaning operations before the product is completed will be seen in this display. At the same time various types of cleaning operations will be pictorially illustrated, together with the latest developments in Oakite cleaning materials and methods.

The latest developments in arc-welding machines and electrodes will be demonstrated by the Lincoln Electric Co., Cleveland, Ohio, using the new "Shield Arc" welding machine for the welding of high-manganese steel, high-carbon steel, stainless steel, cast iron, aluminum, and copper. Two new small motor generator types of arc-welding machines

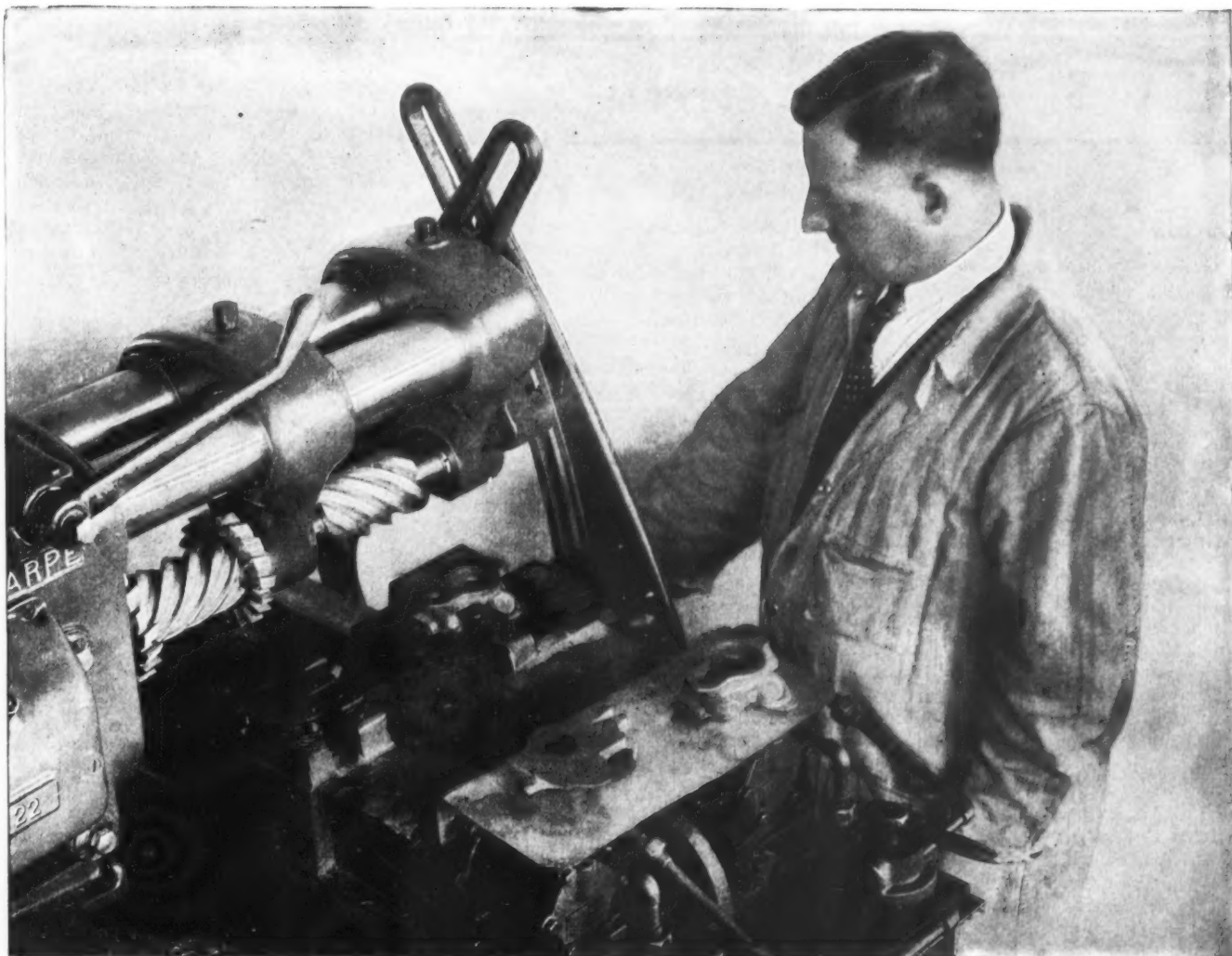
will also be in operation welding sheet metal. The latest type of automatic shielded carbon arc welding machine will be in operation.

The Carpenter Steel Co., Reading, Pa., will give a demonstration of the new "matched set method" of selecting the right tool steel for different kinds of tools. By means of a simple diagram, a toolmaker can, of his own knowledge, select the proper tool steel for new tools or overcome his difficulties with old ones. The Carpenter torsion impact machine for measuring the toughness of hardened tool steel will be shown in operation. Carpenter stainless steels and their applications will complete this exhibit.

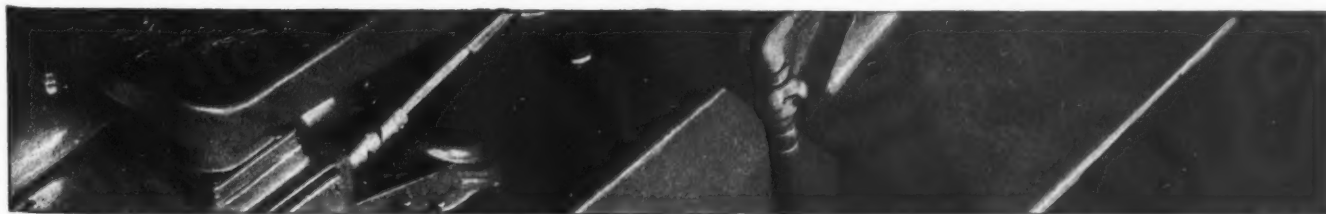
A lighted display of samples of lubricants, together with a Cornell testing machine, on which tests will be made of the company's "extreme pressure industrial lubricants," will be part of the exhibit of E. F. Houghton & Co., Philadelphia, Pa. There will also be a motion display of charts, graphs, and pictures, visualizing the properties of the company's straight cutting oils. Vim Tred belting will also be on display.

A product known as "Tite-Seal" will be exhibited by the Fostoria Pressed Steel Corporation, Fostoria, Ohio. This product was developed for sealing finely machined joints, eliminating the necessity for lapping and grinding. It is now also used extensively to stop wick action on washers, to seal gasoline line joints, to prevent rust and corrosion on threads, studs, nuts, bolts, etc., to lubricate springs, shackles, and auto body parts, and for emergency high-temperature lubrication. The company also will have on display the Sorwal coolant filter and its machine lamp, which products have previously been described in *MACHINERY*.

By means of new extreme pressure lubricant testing machines, recently developed, D. A. Stuart & Co., Chicago, Ill., will demonstrate the load-carrying and wear characteristics of newly developed lubricating oils and greases now required for the increased speeds and loads of metal-working machinery, steel mill machinery, and similar equipment. One or more of these testing machines will be in operation at practically all times, and visitors are invited to bring plain cans of not less than one pint content of any lubricant which they would like to have tested for load-carrying capacity and degree of wear.



No. 22 *has* TWO FUNDAMENTALS for REAL MODERNIZATION



. . . . FULL PRODUCTIVE CAPACITY

—Strength—Power—Rigidity with wide Speed and
Feed Ranges to give Maximum Production with Accuracy

. . . . LOW NON-PRODUCTIVE TIME LOSS

BS —Handy—Sensitive with unusual Flexibility of Control
such as in a "Column and Knee" Design to enable Quick Set-Ups

It's MODERN — may we send details? — Brown & Sharpe Mfg. Co., Providence, R.I., U.S.A.

BROWN & SHARPE

No. 22 PLAIN MILLING MACHINE

NEWS OF THE INDUSTRY

Canada

INGERSOLL MILLING MACHINE CO., Rockford, Ill., announces that the sale of Ingersoll cutters is now being handled in Canada by the J. H. RYDER MACHINERY CO., of Toronto, for the Ontario district, and the T. E. RYDER MACHINERY CO., of Montreal, for Quebec and eastern Canada.

California

STERLING ELECTRIC MOTORS, INC., Los Angeles, Cal., is making substantial additions to the company's factory and production facilities. A new modern steel factory building, including enlarged executive and administrative offices, as well as warehouses, will more than double the present plant capacity. Modern machine tool and shop equipment will be installed.

MILES C. SMITH, who has been active in the development and sale of "hard metals" over a period of years, has recently become connected with Colmonoy, Inc., Los Nietos, Cal., as sales manager. Mr. Smith was formerly connected with the Stoddy Co., Whittier, Cal.

Connecticut and Massachusetts

FRANK J. McCARTY has been appointed general sales manager of the Hendey Machine Co., Torrington, Conn.,



Frank J. McCarty, General Sales Manager, Hendey Machine Co.

with supervision over domestic and foreign sales. Mr. McCarty has been connected with the sales department of the company since early in 1928. He was formerly connected with the Rudell Belnap Machinery Co. of Montreal, Canada. He has spent his entire business career in the machine tool industry.

NELSON J. DARLING, manager of the River Works of the General Electric Co., Lynn, Mass., has also assumed the management of the West Lynn plant of the company, upon the retirement of F. P. Cox, formerly manager of the West Lynn Works. Mr. Cox has been associated with the General Electric Co. for forty-five years. N. M. DUCHEMIN, formerly superintendent of the West Lynn Works, will be assistant manager in charge of operations at West Lynn. W. G. MITCHELL continues as assistant manager in charge of operations at the River Works.

REVERE COPPER & BRASS, INC., 230 Park Ave., New York City, announce that the offices of the Taunton-New Bedford division of the company have been removed from Taunton, Mass., to New Bedford, Mass. Mill operations will, however, be continued in Taunton and a warehouse will be maintained there. R. G. Scott, vice-president, is in charge of this division.

Georgia

L. H. GILMER Co., Tacony, Philadelphia, Pa., has appointed WILLIAM W. CONARD southern representative of the company, covering the states of North and South Carolina, northern Georgia and Alabama, and eastern Tennessee. Mr. Conard's headquarters are at the Atlanta branch, 95 Pine St., N.E., Atlanta Ga.

Illinois, Indiana, and Missouri

J. H. BROWN, formerly eastern sales manager of the Sullivan Machinery Co., has joined the Worthington Pump & Machinery Corporation, Harrison, N. J., as regional manager of the mining and construction division, covering the midwestern territory with headquarters in Chicago. Mr. Brown is a graduate of the Massachusetts Institute of Technology, class of 1905. He is well known in construction and mining circles.

ALUMINUM INDUSTRIES, INC., Cincinnati, Ohio, manufacturers of Permite products, have opened a new office in the Petroleum Bldg., 616 S. Michigan Ave., Chicago, Ill., to service the central states. R. L. COREY, long connected with the automotive and industrial trade, has become district sales representative for the central territory. N. R. PATTERSON will also have his headquarters in the Chicago office as sales engineer.

C. M. ROBERTSON, who for several years has been connected with the E. L. Essley Machinery Co., Chicago, Ill., is now associated in a sales capacity with the Marshall & Hushart Machinery Co., 571 W. Washington Blvd., Chicago, Ill. Mr. Robertson is well known in the Chicago machine tool trade, having come to the city many years ago as the direct representative of the Colburn Machine Tool Co.

CROWE NAME PLATE & MFG. CO., 1749 Grace St., Chicago, Ill., manufacturer of decorative metal parts, automotive panels, dials, nameplates, and radio control units, is expanding its plant by the construction of a one-story addition, 107 by 150 feet. The cost, together with equipment, is estimated at \$65,000.

YOUNG STEEL & WIRE CORPORATION, Detroit, Mich., has completed a second branch plant in the Clearing industrial district, Chicago, Ill. The new plant will be used for the production of high-carbon steel coil springs and will employ about 400 people.

MARTIN H. KIDDER has been appointed industrial relations director of the American Foundry Equipment Co., Mishawaka, Ind., to serve industrial and product engineers in the application of the company's "Wheelabrator," which provides for an airless abrasive cleaning method. Mr. Kidder was formerly with the Link-Belt Co., the Boston Gear Works, and the Apollo Metal Works, handling engineering educational work, advertising, and publicity.

KENNEDY VALVE MFG. CO., Elmira, N. Y., announces the appointment of O. R. LANE as representative of the company in Oklahoma, Arkansas, Tennessee, eastern Missouri, and southern Illinois and Indiana, with headquarters at 455 Paul Brown Bldg., St. Louis, Mo.

REPUBLIC STEEL CORPORATION, Youngstown, Ohio, has opened a new sales office at 622 Dwight Bldg., Kansas City, Mo., with ROBERT L. PIERCE, formerly of the St. Louis district sales office, in charge.

J. P. DISTLER has been appointed manager of sales of the wire division, with headquarters at the Grand Crossing plant in Chicago. Mr. Distler succeeds R. W. HULL, whose duties as assistant manager of sales for all Republic products in the Chicago district will now receive his entire time.



... recommends
and uses **SUNOCO!**

*—like many other well-known
machine tool manufacturers*

CINCINNATI Milling Machine and Cincinnati Grinders, Inc.,—as well as many other prominent machine tool manufacturers—realize that more pieces per tool grind, more satisfactory work, increased production and lower cutting cost are direct benefits of the lubricating and cooling effect produced by Sunoco.

Faster, better grinding and more grinding per abrasive unit, with less time out for re-

placing and resetting grinding wheels, are all made possible by the use of Sunoco.

In Your Shop

On performance and performance alone Sunoco has won recognition wherever machine tools are operated.

In your shop under your own operating conditions Sunoco will amply demonstrate its value as an aid in establishing new and higher standards of machine tool efficiency.

SUNOCO

EMULSIFYING
CUTTING OIL

Cincinnati 5-48 Plain
Hydromatic Milling
Machine

Lubricant: 1 part Sunoco
Emulsifying Cutting Oil
to 20 parts Water.



Cincinnati No. 2
Centerless Grinder—

Coolant: 1 part Sunoco
Emulsifying Cutting Oil
to 40 parts Water.



SUN OIL COMPANY, PHILADELPHIA *Subsidiary Companies:* Sun Oil Co., Ltd., Montreal
British Sun Oil Co., Ltd., London, England

Michigan and Wisconsin

READ MACHINERY CO., INC., York, Pa., announces the appointment of J. R. STEWART as the company's representative located at 17511 Pennington Drive, Detroit, Mich.

HEVI DUTY ELECTRIC CO., Milwaukee, Wis., manufacturer of electric heat-treating furnaces, announces that the company has acquired by purchase from the A. O. SMITH CORPORATION all rights and patents relating to Smith Alloy No. 10, a new chromium-iron-aluminum alloy, the invention of S. L. Hoyt and R. S. Archer. The alloy is used in Hevi Duty heat-treating furnaces for industrial and laboratory use at temperatures up to 2400 degrees F.

HARNISCHFEGER CORPORATION, Milwaukee, Wis., has completed an entirely new building which will be used exclusively in the manufacture of electric hoists. This addition was made to meet the demand for larger manufacturing capacity.

New York and New Jersey

S. S. WHITE DENTAL MFG. CO., announces that the industrial division of the company has moved its offices to larger quarters at 10 E. 40th St., New York City. This division handles all of the industrial products manufactured by the company, including flexible shafts, flexible shaft driven machines, small cutting and grinding tools, molded resistors, etc. GEORGE T. LATIMER is manager of the division.

HANSON - VAN WINKLE - MUNNING CO., Matawan, N. J., announces that the company will henceforth be the exclusive distributors of the Bausch & Lomb electroplaters' microscope in the electroplating industry. This microscope makes

it possible for the plater to determine the exact thickness of the plate at any desired place. The instrument magnifies to such an extent that a plate 0.010 inch thick would appear as if 4 inches thick.

Ohio

JOHN W. CARPENTER, for sixteen years district sales manager in the Cleveland territory for the Otis Steel Co., has joined the Republic Steel Corporation as assistant manager of sales, sheet and strip division, at the company's headquarters at Youngstown, Ohio. Mr. Carpenter is a graduate of Princeton University.

DESIGNERS FOR INDUSTRY, INC., Terminal Tower, Cleveland, Ohio, has been organized for the purpose of rendering a complete service to industry in product design, styling, sales presentation, and promotion. The principals of the organization are: Charles H. Oppenheimer, Onnie Mankki, Lawrence Blazey, and Glenn Tammen.

MAY-FRAN ENGINEERING is the name of a new company located at 1710 Clarkstone Road, Cleveland, Ohio. The company specializes in the design and manufacture of material-handling machinery and equipment, such as chain, roller, and belt conveyors, and special trucks.

Pennsylvania

T. I. PHILLIPS, works manager of the East Pittsburgh plant of the Westinghouse Electric & Mfg. Co., has been appointed general works manager of the Westinghouse Electric & Mfg. Co. In his new position, Mr. Phillips will serve as the central authority for all manufacturing operations of the company. Mr. Phillips has been with the Westing-

house company since 1915. In 1930 he was appointed works manager of the Nuttall plant of the company; three years later he was made works manager at East Pittsburgh, which position he held until his recent appointment as general works manager. He succeeds C. H. CHAMPLAIN, who has been forced by prolonged illness to relinquish his activities with the company.

R. E. W. HARRISON, who has been chief of the Machinery Division, Bureau of Foreign and Domestic Commerce, Washington, D. C., since April, 1934, has resigned to resume consulting practice in the metal-working industries. He will be associated with Eugene C. Clarke, with offices at 1818 Packard Bldg., Philadelphia, Pa. The scope of his new activity will cover the entire range of management, including design, manufacturing, and merchandising.

SUMMERILL TUBING CO., Bridgeport, Pa., at the last meeting of the board of directors re-elected E. L. Parker president. J. P. Boore, who has been assistant to the president for the last two years, was elected vice-president and is moving from Pittsburgh to Bridgeport. George P. Kraemer was elected secretary and treasurer. He will continue to serve as assistant manager of the Philadelphia branch of Edgar T. Ward's Sons Co. N. H. Wolf will continue as general manager.

DANLY MACHINE SPECIALTIES, INC., 2112 S. 52nd Ave., Chicago, Ill., manufacturers of standard and special die sets and diemakers' supplies, have opened an assembly plant and branch office at 3913 N. Broad St., Philadelphia, Pa., with S. R. ANSTEY in charge.

J. M. MCNEAL, European sales manager, covering both Great Britain and continental Europe for the Landis Machine Co., Inc., Waynesboro, Pa., is at present visiting the home office in Waynesboro.



A scene observed at Elmira, N. Y.—obsolete machine tools finding their way to the scrap pile. Some of the machines, as one may observe from the photograph, are not very old; but when put into competition with those of present-day design, they were, nevertheless, obsolete. They were a liability rather than an asset to the owner, and he did not hesitate to do the obvious thing.

MORSE MAGIC SELECTOR

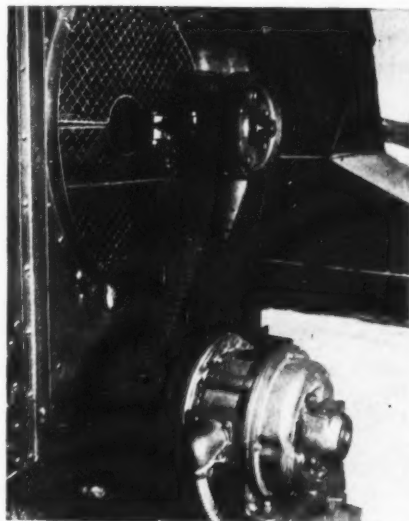
TAKES "MYSTERY" OUT OF SILENT CHAIN DESIGNING

Automatically Designs Silent Chain Drives

As usual, Morse is ahead in serving industry. This time we have developed the Morse Silent Chain Selector—a perfected device that takes all the mystery out of selecting the correct silent chain for any drive from $\frac{1}{2}$ H.P. to 150 H.P., covering practically all possible chain drive installations . . . proper chain length, pitch, minimum number of teeth, power requirements are all easily obtained.

With this new selector you can design silent chain drives easily and receive the many advantages which these time-proven drives provide—flexible, positive, long-life, low first and maintenance cost, adaptable to any centers.

This new aid to industry is ready for distribution to users and designers of silent chain drives. Write Morse Chain Company, at Ithaca, New York, for the Morse Silent Chain Selector.



For Fan Drives

One of the eighty fan drives in Baker Laboratory at Cornell University—Morse Silent Chains have been successfully used as drives on this equipment over a period of years.

20 Years of Service

By the time any piece of equipment has rendered 20 years of service in any one plant, it may be regarded as an old friend. A prominent knitting mill in Rockford, Ill. (name on request), has 40 such friends in the shape of 40 Morse Silent Chain Drives that have been running for a

MORSE SILENT CHAIN DRIVE SELECTOR

Select the proper silent chain drive in one operation.

The Morse Silent Chain Drive Selector simplifies the selection of the proper silent chain drive for the majority of installations. For unusual conditions or drives of smaller or greater capacity than shown, please consult the Engineering Department.

Follow instructions 1, 2, 3. For low driving speeds see other side.

All chain drives will give better results if properly lubricated. The use of a chain case with Morse lubrication is recommended. The selector will take the "mystery" out of the selection of silent chain drives, the best and most modern way to transmit power!

Read in window, below your chain, in the order mentioned: (a) Outside diameter of driving, (b) and outside diameter of driven sprocket, (c) standard center, (d) and length of chain (all in inches).

CHAINS, PITCH & WIDTH

Chain	Pitch	Width
1	1 1/2"	1 1/2"
2	1 3/4"	1 3/4"
3	2"	2"
4	2 1/4"	2 1/4"
5	2 1/2"	2 1/2"
6	2 3/4"	2 3/4"
7	3"	3"
8	3 1/4"	3 1/4"
9	3 1/2"	3 1/2"
10	3 3/4"	3 3/4"
11	4"	4"
12	4 1/4"	4 1/4"
13	4 1/2"	4 1/2"
14	4 3/4"	4 3/4"
15	5"	5"
16	5 1/4"	5 1/4"
17	5 1/2"	5 1/2"
18	5 3/4"	5 3/4"
19	6"	6"
20	6 1/4"	6 1/4"
21	6 1/2"	6 1/2"
22	6 3/4"	6 3/4"
23	7"	7"
24	7 1/4"	7 1/4"
25	7 1/2"	7 1/2"
26	7 3/4"	7 3/4"
27	8"	8"
28	8 1/4"	8 1/4"
29	8 1/2"	8 1/2"
30	8 3/4"	8 3/4"
31	9"	9"
32	9 1/4"	9 1/4"
33	9 1/2"	9 1/2"
34	9 3/4"	9 3/4"
35	10"	10"
36	10 1/4"	10 1/4"
37	10 1/2"	10 1/2"
38	10 3/4"	10 3/4"
39	11"	11"
40	11 1/4"	11 1/4"
41	11 1/2"	11 1/2"
42	11 3/4"	11 3/4"
43	12"	12"
44	12 1/4"	12 1/4"
45	12 1/2"	12 1/2"
46	12 3/4"	12 3/4"
47	13"	13"
48	13 1/4"	13 1/4"
49	13 1/2"	13 1/2"
50	13 3/4"	13 3/4"
51	14"	14"
52	14 1/4"	14 1/4"
53	14 1/2"	14 1/2"
54	14 3/4"	14 3/4"
55	15"	15"
56	15 1/4"	15 1/4"
57	15 1/2"	15 1/2"
58	15 3/4"	15 3/4"
59	16"	16"
60	16 1/4"	16 1/4"
61	16 1/2"	16 1/2"
62	16 3/4"	16 3/4"
63	17"	17"
64	17 1/4"	17 1/4"
65	17 1/2"	17 1/2"
66	17 3/4"	17 3/4"
67	18"	18"
68	18 1/4"	18 1/4"
69	18 1/2"	18 1/2"
70	18 3/4"	18 3/4"
71	19"	19"
72	19 1/4"	19 1/4"
73	19 1/2"	19 1/2"
74	19 3/4"	19 3/4"
75	20"	20"
76	20 1/4"	20 1/4"
77	20 1/2"	20 1/2"
78	20 3/4"	20 3/4"
79	21"	21"
80	21 1/4"	21 1/4"
81	21 1/2"	21 1/2"
82	21 3/4"	21 3/4"
83	22"	22"
84	22 1/4"	22 1/4"
85	22 1/2"	22 1/2"
86	22 3/4"	22 3/4"
87	23"	23"
88	23 1/4"	23 1/4"
89	23 1/2"	23 1/2"
90	23 3/4"	23 3/4"
91	24"	24"
92	24 1/4"	24 1/4"
93	24 1/2"	24 1/2"
94	24 3/4"	24 3/4"
95	25"	25"
96	25 1/4"	25 1/4"
97	25 1/2"	25 1/2"
98	25 3/4"	25 3/4"
99	26"	26"
100	26 1/4"	26 1/4"
101	26 1/2"	26 1/2"
102	26 3/4"	26 3/4"
103	27"	27"
104	27 1/4"	27 1/4"
105	27 1/2"	27 1/2"
106	27 3/4"	27 3/4"
107	28"	28"
108	28 1/4"	28 1/4"
109	28 1/2"	28 1/2"
110	28 3/4"	28 3/4"
111	29"	29"
112	29 1/4"	29 1/4"
113	29 1/2"	29 1/2"
114	29 3/4"	29 3/4"
115	30"	30"
116	30 1/4"	30 1/4"
117	30 1/2"	30 1/2"
118	30 3/4"	30 3/4"
119	31"	31"
120	31 1/4"	31 1/4"
121	31 1/2"	31 1/2"
122	31 3/4"	31 3/4"
123	32"	32"
124	32 1/4"	32 1/4"
125	32 1/2"	32 1/2"
126	32 3/4"	32 3/4"
127	33"	33"
128	33 1/4"	33 1/4"
129	33 1/2"	33 1/2"
130	33 3/4"	33 3/4"
131	34"	34"
132	34 1/4"	34 1/4"
133	34 1/2"	34 1/2"
134	34 3/4"	34 3/4"
135	35"	35"
136	35 1/4"	35 1/4"
137	35 1/2"	35 1/2"
138	35 3/4"	35 3/4"
139	36"	36"
140	36 1/4"	36 1/4"
141	36 1/2"	36 1/2"
142	36 3/4"	36 3/4"
143	37"	37"
144	37 1/4"	37 1/4"
145	37 1/2"	37 1/2"
146	37 3/4"	37 3/4"
147	38"	38"
148	38 1/4"	38 1/4"
149	38 1/2"	38 1/2"
150	38 3/4"	38 3/4"

For each 1" change of center, add or subtract 2' of chain.

Simple and Easy to Use—It's Free

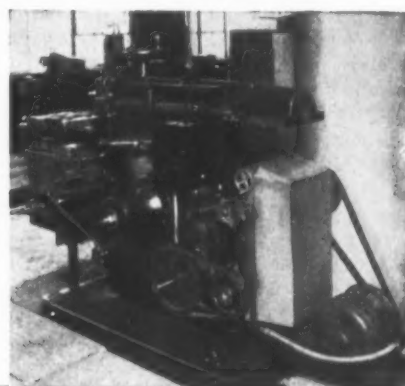
Be sure to send for one of these Morse Silent Chain Selectors. You'll find it very useful—a time saver—an accurate, sure method of automatically designing silent chain drives

generation. These are $2\frac{1}{2}$ " units, transmitting 13 H.P. between 17 and 49 tooth sprockets.



On Milling Machine

Machine Tool manufacturers are large users of Morse Silent Chains. No other form of drive is as reliable, positive, efficient and economical, and simple and easy to install.



Box Making Machine Installation

An installation of Morse Silent Chains on a box making machine. Note motor drive to variable speed transmission and drive from transmission to machine—a typical and satisfactory installation.

Did you attend the Machine Tool Show? Everybody there came away with an appreciation of many advances made in machine tool design and manufacture. Probably no show in years has been better attended . . . a definite indication of the upward business trends in industry.

MORSE CHAIN COMPANY, ITHACA, N. Y.
DIVISION OF BORG-WARNER CORPORATION

MACHINERY, October, 1935—73

NEW BOOKS AND PUBLICATIONS

WHAT MUST WE DO TO SAVE OUR ECONOMIC SYSTEM? By Dr. Thomas Nixon Carver, Professor of Political Economy, Emeritus, Harvard University. 92 pages, 6 by 9 inches. Obtainable from Franklin L. Pratt, Room 523, 606 S. Hill St., Los Angeles, Calif.

This is a report on the problem of what should be done to retain the desirable features of our economic system and eliminate those that have proved unsatisfactory. This is one of the most clearly written and most definitely analytical of the many investigations of our economic system. Everyone interested in a solution of our business difficulties will find this book well worth reading, and is most likely to obtain from it many new ideas and viewpoints not ordinarily understood. One of the principal points made with regard to our present economic set-up is that our economic methods are not necessarily either capitalistic, competitive, or individualistic. There is perfect freedom under our set-up to apply any other economic method that a group of people voluntarily wish to adopt. We can have cooperation instead of competition, if a sufficient number of people wish to cooperate; and we have. Every large industrial enterprise is based upon the cooperation of thousands of people. In fact, there have been within our borders scores of communistic communities, although few of them have survived—presumably because man's normal tendency runs toward economic freedom and the advantages that he feels can be gained thereby. Then, going deeper into the subject, the book also hints at the fact that monopolies interfere with economic freedom just as much as would complete governmental regulation and compulsion. Truly economic freedom we have never had; but that is the aim to be pursued rather than less freedom.

FINISHING METAL PRODUCTS. By Herbert R. Simonds. 337 pages, 6 by 9 inches; 147 illustrations. Published by the McGraw-Hill Book Co., Inc., New York City. Price, \$3.50.

In many metal-fabricating plants, the processes required to obtain surface appearance represent fully a third of the total plant activities. The annual cost of polishing operations alone in this country is estimated at about \$450,000,000. In the cutlery industry, the cost of polishing and plating usually exceeds 50 per cent of the production cost. Many of the other finishing processes are also of prime importance. There has been very little published in book form, however, pertaining to metal-finishing operations, and the present book will, there-

fore, prove of distinct value to industry. It is divided into six sections as follows: Commercial Aspects of Finish and Appearance; Preparation for the Finish of Metal Products; Polishing and Buffing; Plating and Spray Coating; Painting; Special Finishes.

FORGED TOOLS. 43 pages, 6 by 9 inches. Simplified Practice Recommendation R17-35, published by the National Bureau of Standards. Obtainable from the Superintendent of Documents, Washington, D. C. Price, 10 cents.

"METAL MASTER" SHEET METAL WORKERS' DESIGN BOOK. 47 pages, 6 by 9 inches. Distributed by the Glascock Bros. Mfg. Co., Muncie, Ind. Price, 25 cents.

"METAL MASTER" SHEET METAL WORKERS' MANUAL. 15 pages, 6 by 9 inches. Distributed by the Glascock Bros. Mfg. Co., Muncie, Ind. Price, 25 cents.

COMING EVENTS

SEPTEMBER 30 - OCTOBER 4—NATIONAL METAL EXPOSITION AND CONGRESS under the auspices of the American Society for Metals to be held in the International Amphitheater, 43rd and Halsted Sts., Chicago, Ill. W. H. Eisenman, secretary, American Society for Metals, 7016 Euclid Ave., Cleveland, Ohio.

OCTOBER 14-15—Eighteenth semi-annual meeting of the AMERICAN GEAR MANUFACTURERS' ASSOCIATION to be held at the General Brock Hotel, Niagara Falls, Canada. J. C. McQuiston, manager-secretary, Penn-Lincoln Hotel, Wilkesburg, Pa.

OCTOBER 21-25—Third annual INDUSTRIAL MATERIALS EXHIBIT to be held at the Hotel Astor, New York City. Further information may be obtained from the News Bureau, Industrial Materials Exhibit, care of Bakelite Corporation, Bound Brook, N. J.

OCTOBER 22-23—INDUSTRIAL PRODUCTS EXHIBIT under the auspices of the Mil-

waukee Association of Purchasing Agents at Schroeder Hotel, Milwaukee, Wis. For further information, address W. H. Wenzel, Vilter Mfg. Co., 2217 S. First St., Milwaukee, Wis.

NOVEMBER 18-20—Twenty-second NATIONAL FOREIGN TRADE CONVENTION of the National Foreign Trade Council in Houston, Tex. Secretary, Lindsay Crawford, National Foreign Trade Council, 26 Beaver St., New York City.

DECEMBER 2-6—Annual meeting of the AMERICAN SOCIETY OF MECHANICAL ENGINEERS at the Engineering Societies' Building, 29 W. 39th St., New York City. C. E. Davies, secretary, 29 W. 39th St., New York City.

DECEMBER 2-7—FIFTEENTH EXPOSITION OF THE CHEMICAL INDUSTRIES at the Grand Central Palace, New York City. Charles F. Roth, manager, Grand Central Palace, New York.

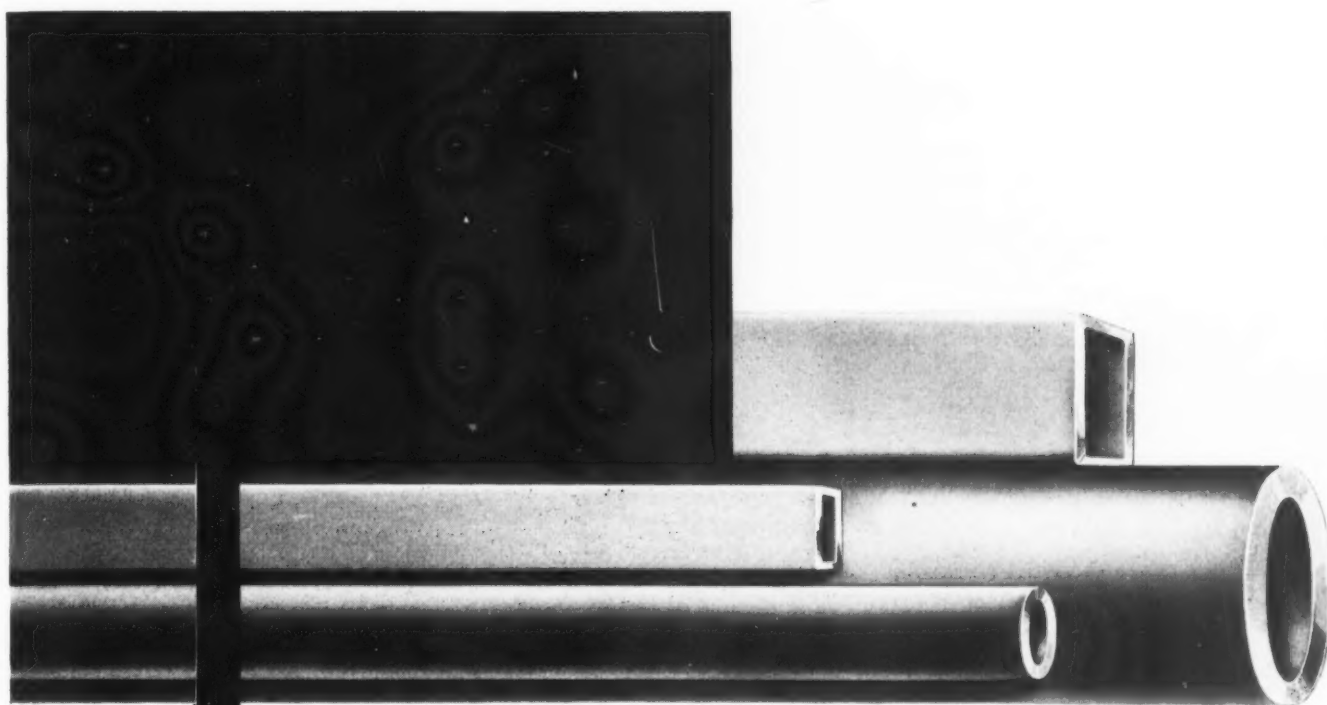
OBITUARIES

Fred B. Smith

FRED B. SMITH, for over twenty-five years New England representative of the Hendey Machine Co., Torrington, Conn., died August 29. Born in Connecticut, he entered the employ of the Hendey Machine Co. in October, 1884, as a machinist apprentice. Later he worked for the company as journeyman machinist and department foreman under Henry J. Hendey, founder of the company. Mr. Smith rounded out a career of fifty years in the employ of the company in October, 1934. A man of much ability, reinforced by a winning personality and ready wit, he made and kept a wide circle of friends by whom he will be greatly missed.

B. H. Johnson

B. H. JOHNSON, assistant to the president of the R. D. Wood Co., Philadelphia, Pa., and recently re-elected vice-president of the American Foundrymen's Association, died in Toronto, Canada, August 27, from pneumonia. Mr. Johnson was born in Lynn, Mass., and was a graduate of the Massachusetts Institute of Technology. After various other associations, he became works manager of the Cresson-Morris Co. of Philadelphia in 1910, remaining with that company for over fifteen years. He then became connected with the R. D. Wood Co.



... for modern-day parts

The parts-maker concerned with making the finest part at the lowest production cost will be wise in choosing NATIONAL-SHELBY Seamless Mechanical Tubing. In using this modern material he will avoid expensive grinding and machining operations, in addition to lowering tool and labor costs. Sometimes just a single cut or light grinding may be all that is needed to make the part, or perhaps a simple swaging, expanding, or upsetting, either from hot-finished or cold-drawn tubing. The finished part will be of fine, uniform steel structure with exceptional strength and no excess weight. Grades and treatments of steel can be furnished to meet practically any requirement. Available in practically any diameter, wall-thickness, and length required, and in various shapes for special purposes.

Send in your blue print or specification of a part for which you would like to consider seamless mechanical tubing, and let us go over it. It may mean better profits for you. Send for Seamless Handbook.

NATIONAL TUBE COMPANY • Pittsburgh, Pa.

Pacific Coast Distributors—COLUMBIA STEEL CO., San Francisco, Calif.

Export Distributors—UNITED STATES STEEL PRODUCTS CO., New York, N. Y.

United States Steel  *Corporation Subsidiary*

SEAMLESS MECHANICAL TUBING

Classified Contents of this Number

DESIGN, FIXTURE AND TOOL

- Indexing Fixture for Machining Compressor Ports
—By Charles C. Tomney..... 124
- Hand-Operated Counterboring Tool—
By Edward A. Healey..... 127

DESIGN, MACHINE

- The Machine Designer Must Follow the Trend of
the Times—By Bernard Lester..... 105
- Combination Cam and Differential Gear Movement
for Chain Conveyor—By J. E. Fenno..... 115
- Differential Ratchet for Imparting Slow Axial
Movement to Feed-Screw—By F. E. Judson.... 116
- Crank Motion with Dead Center Eliminated—
By L. Kasper..... 117
- Laying Out Hobs for Spline Shafts—
By Earle Buckingham..... 118

DIEMAKING, DIE DESIGN, AND PRESS WORK

- Die for Making a U-Shaped Bend in Round Stock
—By Victor Arkin..... 123
- Die for Piercing Ten Slots in Wall of Drawn Shell
—By Henry W. Boehly..... 125

HEAT-TREATING PRACTICE

- Heat-Treating Diversified Work on a Quantity
Production Basis—By J. B. Nealey..... 108

MANAGEMENT PROBLEMS

- Industry Reports a Shortage of Skilled Workers.. 114
- Spending Profits on Unprofitable Business..... 114
- Machinery Sold on Installment Plan Erected in a
Mortgaged Building—By Leo T. Parker..... 128

MATERIALS, METALS, AND ALLOYS

- Material for Corrosion-Resisting Springs..... 128
- The Seventeenth Annual National Metal Exposi-
tion 129

A Preview of Some Exhibits at the National Metal Show

- 130
- Carpenter Free-Machining Alloy Steels..... 132
- Stainless Steels Gain Ground Steadily..... 133
- Recent Applications of Nickel Steels and Alloys.. 134
- New Steel for Cold-Header Dies..... 135
- Die-Castings are Steadily being Improved..... 136
- The Use of Aluminum in Machine Design..... 137
- The Broadening Field for Synthetic Plastics..... 138
- Condensed Review of Some Recently Developed
Materials 139
- Present Status of Cemented-Carbide Cutting Tools 167

NEWS OF INDUSTRY

- Marked Improvement in British Industrial Condi-
tions 104
- Machine Tool Building in Soviet Russia..... 107
- Course in Diesel Engineering..... 111
- Engineering News Flashes..... 112
- Canadian Machinery Trade in 1934..... 119
- Indications of Sustained Business Improvement.. 166
- Metal Products Exhibit in New York..... 167

SHOP PRACTICE

- Manufacturing Hardened and Ground Gears for
Turret Lathes—By W. J. Burger..... 101
- Finishing Zinc and Aluminum Die-Castings—
By Herbert Chase..... 120
- Bonderizing Process Installed by Buick Motor Co. 126
- A Delicate Lapping Operation—
By Lewis N. Stewart..... 127
- Shop Equipment News 147
- Measuring the Finish on Timken Bearings..... 166

WELDING PRACTICE

- What is Shot-Welding?—By Charles O. Herb..... 97
- Terms Used in Electric Welding Practice..... 110

Your Progress Depends Upon Your Knowledge of Your Industry

SHOP EQUIPMENT SECTION

tance from the saw to the column of the machine is 14 inches. The saw runs at a speed of 125 feet per minute, and the files at 180 feet per minute.

Phillips Self-Centering-Head Screws and Bolts

A line of machine screws and stove bolts with Phillips recessed self-centering heads, as shown in the illustration, is being introduced by the American Screw Co., Providence, R. I. This line includes machine screws with flat, round, oval and fillister heads, and stove bolts with flat, round, and oval heads. The heads of these screws and bolts have a tapered recess which exactly fits a tapered driver. Only four Phillips drivers or bits are required for the entire range of screw and bolt sizes, and two sizes of drivers fit the range of sizes most commonly used.

It is claimed that these screws and bolts can be set up tighter than those having regular slotted heads without danger of breaking the heads. They can be held on the point of the driver and brought into position with one hand, which is an advantage when driving them in places that are not easily accessible. The self-centering feature prevents the driver from slipping sideways and marring the finished surfaces or injuring the hands.



Phillips Machine Screws and Bolts with Self-centering Heads

Link-Belt Self-Aligning Roller-Bearing Units

The Link-Belt Co., 910 S. Michigan Ave., Chicago, Ill., has recently brought out a Series 400 line of bearing units equipped with Shafer self-aligning double-row roller bearings. These units are available in pillow blocks, flanged units, take-up units, and hangers.

The advantages claimed for the new units are the ability to carry radial loads, thrust loads, and combined radial and thrust loads. Inherent self-alignment is derived from the use of concave rollers between convex outer races and a spherical inner race on the sleeve. The sleeve is free to be deflected with a



Link-Belt Pillow Block with Shafer Roller Bearing

shaft temporarily misaligned or out of line due to inaccuracies of installation. Labyrinth seals protect the bearings. The bores are ground for direct application to shafts. All of these units are available for shaft sizes from 3/4 inch to 3 inches.

Hammond Automobile Fender Polishing Lathes

A new line of polishing lathes especially designed for automobile fender polishing and other work of a similar nature requiring a wide-swing lathe has been announced by the Hammond Machinery Builders, Inc.,

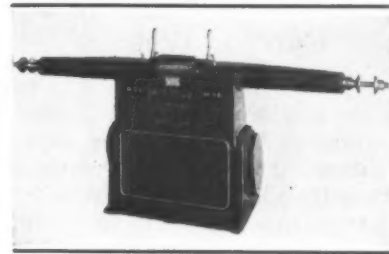


Fig. 1. Hammond Model 5RR Polishing Lathe



Fig. 2. Hammond 15ROEH Automobile Fender Polishing Lathe

Kalamazoo, Mich. The accompanying illustrations show two models of these machines, several of which have recently been installed in some of the larger automobile shops in the Detroit section. The Model 5RR wide-swing polishing lathe, shown in Fig. 1, has two independent spindles and two motors in the base, one for each spindle, with V-belt drive from the motors to the spindles. It is made in three sizes for 3- to 15-horsepower motors, with a maximum dimension from the side of the base to the inside of wheels of 30 inches.

In Fig. 2 is shown the Model 15ROEH wide-swing overhanging spindle polishing lathe in the 15-horsepower size. This model is designed for automobile fender polishing or other work requiring a large working space around the wheels. Either 10-, 15-, or 20-horsepower motors are mounted in the base, with V-belt drives to the spindles. The spindle has an 8-inch overhang in the front of the base, and is 96 inches long over all. The distance from the side of the base to the inside of the wheels is 20 inches.

SHOP EQUIPMENT SECTION

Miller Alternating-Current Welders

Light-weight steel down to 26 gage can be welded with an amperage of 15 to 275 by an alternating-current electric arc welder recently added to the "Wonder" line of the Miller Electric Mfg. Co., Inc., Appleton, Wis. This machine is also recommended by the manufacturer for the cold-welding of cast-iron motor blocks, cylinder heads, and machine pieces. It is supplied complete with welding leads and a hand shield as illustrated, and it is equipped with handles for portable use.

This welder is built in three sizes, one of which handles electrodes from 1/16 to 5/32 inch, and another from 1/16 to 1/4

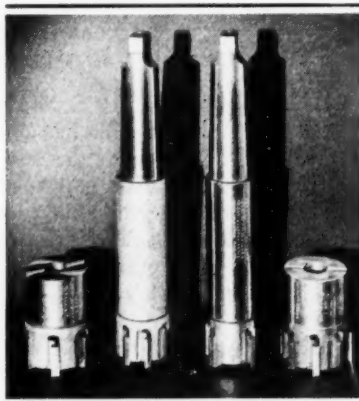


Miller Arc Welder for Light-gage Sheets

inch. The third size is intended for light power service. All three sizes operate on 220-volt, 60-cycle, single-phase current.

Ingersoll Zee-Lock Core Drills and Reamers

The Zee-Lock cutter blade construction incorporated in milling cutters made by the Ingersoll Milling Machine Co., Rockford, Ill., which has been previously described in MACHINERY, has



Ingersoll Core Drills and Reamers with Zee-Lock Cutters

now been applied to boring tools. The renewable inserted-blade core drill or reamer of this construction can be reground to size by inserting each cutter blade in the slot next to its original position. This moves the blade out an amount equivalent to only part of a serration, thus minimizing the amount of regrounding required to bring the tool to size. Eight to thirty-six adjustments or resettings are possible with one set of blades.

The housings or bodies of the boring tools are all of forged and heat-treated alloy steel. The Zee-Lock cutter blades can be furnished in forged high-speed steel, super-cobalt high-speed steel, or Stellite. Zee-Lock blades tipped with cemented carbide are also available.

Small-Size High-Speed Air Grinder

An air grinder that is only 5 inches long, weighs only 8 1/2 ounces and develops approximately 100,000 revolutions per minute has been brought out by Monnier Bros., Inc., Algonac, Mich. This grinder is constructed of aluminum and steel. It is designed to prevent dust or abrasives from reaching the ball bearings or other bearing surfaces.

Unbalanced Wages and Prices

A booklet entitled "The Penalty of Unbalanced Wages and Prices" has been published by Allen W. Rucker in collaboration with N. W. Pickering, president of the Farrel-Birmingham Co., Inc., Ansonia, Conn. In this booklet, it is pointed out that prolonged unemployment and reduced annual incomes of wage-earners continue as long as wage rates are artificially maintained above the general price level. The booklet proceeds to show how unbalanced wage rates cause unemployment; prevent re-employment; decrease annual incomes; and reduce the demand for factory products. Wage rates in line with the prevailing price level make possible prices that would stimulate demand, create employment, and add to the annual income of wage-earners. The booklet is not a mere expression of opinion, but is based upon available employment and price statistics.

* * *

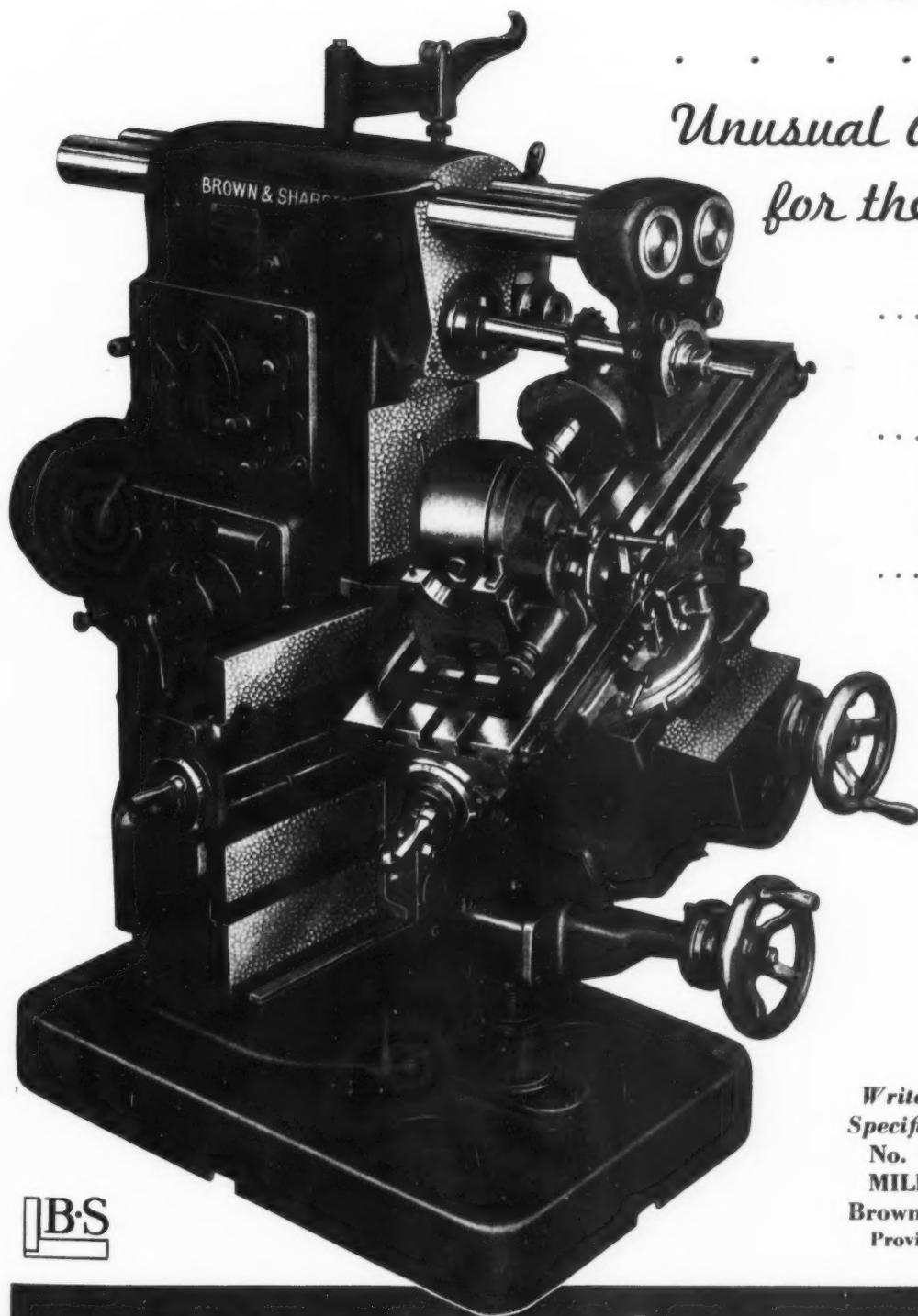
How the machine tool aids the astronomer will be described in an article "Modern Astronomy Relies on the Machine Shop" in December MACHINERY.



Air Grinder which Runs at a Speed of 100,000 R.P.M.

UNIQUE *in* PERFORMANCE

*New in Design
... with
Unusual Advantages
for the Toolroom*



- ... Provides an easy and accurate method of obtaining both simple and compound angular settings for Milling or Boring Operations.
- ... Widened sphere of usefulness through the Universal Milling Attachment with Crane—thus providing an auxiliary spindle that can be set at any angle horizontally or vertically.
- ... Valuable for Manufacturing Departments on short run work that would not justify fixture expense for obtaining accurate settings for relative surfaces.

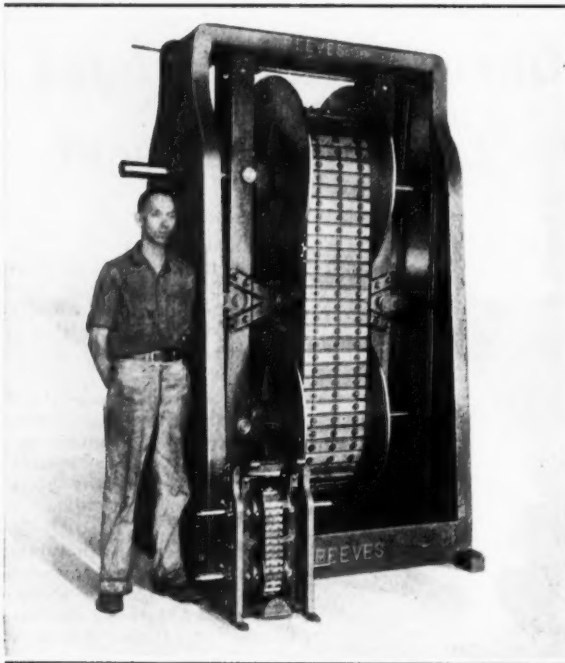
B.S.

*Write for Bulletin and
Specifications of the New
No. 0 OMNIVERSAL
MILLING MACHINE
Brown & Sharpe Mfg. Co.
Providence, R. I., U. S. A.*

*the
New* **BROWN & SHARPE
OMNIVERSAL**

Giant Variable-Speed Transmission

The vertical variable-speed transmission here illustrated is the largest transmission of this kind ever constructed. It was built recently by the Reeves Pulley Co., Columbus, Ind.



Vertical Speed Reducer of Large Proportions Compared with Small Size of Similar Design—Both Built by the Reeves Pulley Co.

This unit gives a 6 to 1 speed ratio and is one of nine Reeves transmissions of varying sizes that will control the speeds of a paper saturating, coating, drying, and cutting machine used in making roofing and shingles.

This unit is 8 feet 2 1/2 inches high, nearly 5 feet wide and 50 inches deep. The conical disks are 39 inches in diameter and the feed belt is 12 inches wide. The weight of the transmission is 5170 pounds.

* * *

Standards for drafting-room symbols have been adopted by the American Standards Association, 29 W. 39th St., New York City. In this standardization work, thirty national organizations have cooperated. The work comprises a much broader scope than drafting-room symbols alone, six important phases of drafting-room work being covered as follows: Graphical symbols on drawings; methods of indicating dimensions; lettering; line work; drawing lay-out; specifications for paper and cloth.

Simplified Anti-Friction Bearing Mounting for Boring Mill Table

The boring mill spindle mounting shown in the accompanying diagram saves power and gives the smoothness of operation and the accuracy found in other types of machine tools equipped with Timken roller bearings. At the same time, machine work on the housing in which the spindle is mounted is greatly simplified. Both assembly and disassembly are facilitated, the design being such as to enable assembling from the top.

The spindle carries Timken cone and roll assemblies at both ends, the upper cone backing against a shoulder on the spindle. A spindle-carrier holds the bearing cups, both upper and lower cups seating against shoulders machined in the carrier. Adjustment of the spindle bearings is secured through an end plate and shims at the bottom of the spindle. In the design shown, the bearings are pre-loaded. Final adjust-

ment of the table against the track may be made by adjusting and clamping a nut on the threads at the bottom of the spindle-carrier.

Oil from the circulating system is forced through the track bearing and an oil bath is maintained for this bearing at all times. The outward

overflow from the track bearing into the pinion housing maintains an oil bath there which lubricates the pinion and bearings. The inward overflow feeds by gravity, lubricating the roller bearings at the top and bottom of the table spindle.

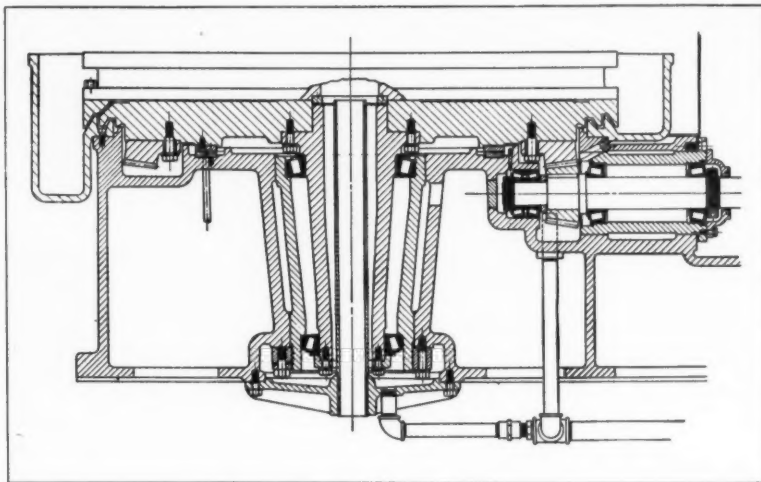
The type of mounting shown was developed by the Timken and Niles engineering departments. It is now being used by the Niles Machine Tool Division of the General Machinery Corporation, and is employed in the 66-inch table of a vertical grinder installed in the Timken plant.

* * *

Colloidal Graphite for Lamp Bases

Incandescent lamp bases, particularly after the lamp has been in service for a long time, tend to corrode in their sockets and sometimes, in attempting to unscrew an incandescent lamp from its socket, the bulb is separated from its base.

The difficulty can be readily overcome by applying to the threaded portion of the lamp base colloidal graphite suspended in water which forms on solids a tenacious and homogeneous film of graphite and creates not only an efficient dry lubricant, but a valuable anti-corrosive agent. The surface to be treated, after being cleaned of any greasy substance, can be covered with colloidal graphite simply by spraying or brushing. Lamps and fuse plugs so treated should not be screwed into their sockets until the graphite film has thoroughly dried.



Boring Mill Table Equipped with Timken Roller Bearings

MORSE MEETS EVERY POWER TRANSMISSION NEED

Morse has nation-wide engineering service, with a complete line of both Silent and Roller chains, Flexible couplings, and clutches. Morse offers unbiased and competent advice on power transmission problems. Morse can help select the right type of chain for your job, either Silent or Roller, the right kind of coupling with real engineering information. This service is available to industry through Morse representatives throughout the nation. Send Morse your Power Transmission orders

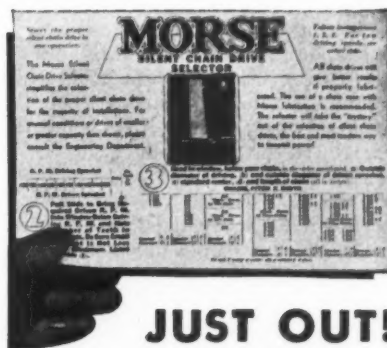


Morse Standard Chain Coupling

A simple assembly consisting of two hardened steel sprockets, wrapped by a Morse Silent Chain, entirely enclosed in a split aluminum cover—grease packed. Due to the great number of contact points between the links in the chain and the sprocket teeth, the load is so distributed that the stress at any one point is small. We believe it is the most easily aligned, as well as the easiest to connect and disconnect of any coupling on the market. Have you bulletin 47 on file?



Long retention of lubrication due to exclusive features in construction is making Morse Roller Chains more popular every day, particularly for those jobs where the service is really tough. Wherever power is transmitted under severe conditions, Morse Roller Chains are standing up and taking it! A better chain at the same price—a Morse product.

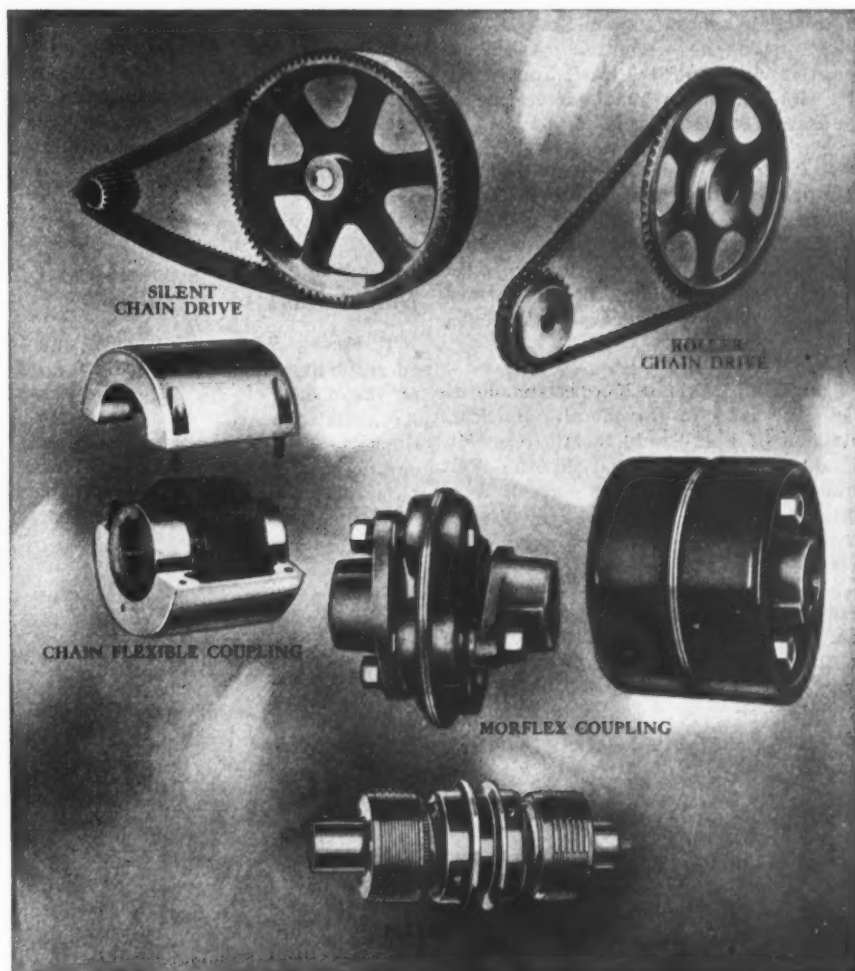


JUST OUT!

Have you asked for yours?

MORSE MAGIC SILENT CHAIN DRIVE SELECTOR

Recently designed and developed by Morse, this silent chain selector is proving a boon to all silent chain users. It automatically selects the proper drive—gives all information quickly and easily, checks and designs chain drives, figures proper chain lengths—saves time and time is money. You can have one of these helpful engineering aids by writing Morse Chain Company, Ithaca, New York. Do this now—we have one for every silent chain user. The Morse Magic Silent Chain Drive Selector is yours for the asking!



MORSE CHAIN COMPANY, ITHACA N. Y.
DIVISION OF BORG-WARNER CORPORATION

MACHINERY, November, 1935—65

NEWS OF THE INDUSTRY

Illinois and Missouri

FREDERICK B. HEITKAMP has been elected vice-president in charge of sales of the Lyon Metal Products, Inc., Aurora, Ill. Mr. Heitkamp became affiliated with the company in July, 1934, as general sales manager. He formerly occupied the same position with the Cincinnati Milling Machine Co. and Cincinnati Grinders, Inc. Mr. Heitkamp will devote his time to furthering the development of sales and markets for the Lyon products, which include steel store fixtures, lockers, steel shelving, and steel furniture.

MAURICE OWENS, 82 Harvard St., Newtonville, Mass., has been appointed exclusive distributor in the New England states for the flexible shaft equipment made by the R. G. Haskins Co., Chicago, Ill. W. F. HIMMELSBACH has joined the company in like capacity, and will serve the territory embracing the state of New York, with the exception of several counties adjacent to New York City. Mr. Himmelsbach's headquarters are at 202 Sands St., Oneida, N. Y.

R. P. KILSBY has been made manager of the western sales territory of the Babcock & Wilcox Tube Co., Beaver Falls, Pa. Mr. Kilsby's headquarters will be at the company's Chicago office in the Marquette Bldg. He was formerly attached to the general sales office at Beaver Falls.

JOSEPH M. BANDISH has been made director of sales of the Metallic Packing Division of Felt Products Mfg. Co. Mr. Bandish will be located in the Felt Products Building at 1508 Carroll Ave., Chicago, Ill.

KENNEDY VALVE MFG. CO., Elmira, N. Y., has appointed WILLIAM GODBEY representative of the company in Kansas, Nebraska, western Missouri, and southwest Iowa. Mr. Godbey's headquarters will be in Kansas City, Mo.

Indiana

REEVES PULLEY Co., Columbus, Ind., manufacturer of variable-speed control equipment, recently completed the third addition to its office and factory since the first of the year. These additions total about 8000 square feet of floor space. The expansion includes the addition of 70 by 50 feet to the machine shop, about 2000 square feet to the assembly department, and 2500 square feet to the sales department.

BANTAM BALL BEARING Co., South Bend, Ind., announces a merger of that company with the TORRINGTON Co., Torrington, Conn. The Bantam Ball Bearing Co. will continue operations in its factory at South Bend as a subsidiary of the Torrington Co. There will be no changes in personnel of the Bantam Ball Bearing Co. at present, and K. L. Herrmann, general manager of that company, will continue to act in that capacity for the new owners.

RALPH R. TEETOR, vice-president in charge of engineering, Perfect Circle Co., Hagerstown, Ind., has been nominated president of the Society of Automotive Engineers for 1936. Mr. Teetor is a graduate of the University of Pennsylvania. He has been active in the work of the Society of Automotive Engineers and has contributed widely to improvements in automobile engine design.

KARL L. HERRMANN, vice-president of the Bantam Ball Bearing Co., South Bend, Ind., has been nominated vice-president in charge of the production activity of the Society of Automotive Engineers.

Massachusetts

T. FRANK WEBSTER has been appointed resident manager of the Boston office of the Link-Belt Co., 910 S. Michigan Ave., Chicago, Ill., succeeding HORACE GOLDSTEIN, who has been assigned to engineering sales work at the Philadelphia office. Mr. Webster was formerly resident manager of the Pittsburgh office.

Michigan

JAMES S. OGSBURY has been elected vice-president and comptroller of Whitman & Barnes, Inc., Detroit, Mich. Mr. Ogsbury will make Detroit his headquarters. ERIK ANDERSEN, treasurer of the company and its subsidiaries, has been elected vice-president and treasurer, with headquarters in Chicago. Mr. Ogsbury has held various executive positions with the International Business Machines Corporation, where he served successively as secretary; treasurer; president of the Dayton Scale Co., a subsidiary; vice-president and general manager of International Business Machines Co., Ltd., of Canada; and general manager of the Dayton Scale Division.

B. G. MUNYAN has joined the sales force of the Welker Machinery Co., Inc., 411 New Center Bldg., Detroit, Mich. Mr. Munyan will act as sales manager for the John Bath tap line.

FRANK LIEBICH has been appointed district manager of the Harnischfeger Corporation, Milwaukee, Wis., in charge of the company's operations in the Detroit district.

New Jersey

JOSEPH T. RYERSON & SON, INC., 16th and Rockwell Sts., Chicago, Ill., recently completed an extensive addition to their Jersey City plant, making available an additional 45,000 square feet of floor space for the stocking of steel and allied lines. The new warehouse, a two-story brick building, is heated throughout, and has the latest equipment for the storing and handling of the finer steel products. Special racks keep the material in good condition and permit quick and easy selection of any grade or size. The heating system holds the temperature at a uniform degree, preventing any condensation of moisture or sudden change that would affect the quality and finish of special steels. Stocks are being rapidly increased. More than 1700 new sizes and kinds of steel have already been added, making a greatly increased steel service immediately available to the eastern area.

JOHN WALDRON CORPORATION, New Brunswick, N. J., announces a new sales policy, by which Francke flexible couplings and replacement parts, formerly sold through general sales agents, will now be offered directly by the manufacturer.

New York

TIMKEN STEEL & TUBE Co., Canton, Ohio, announces the opening of a new office at 16 W. 60th St., New York City, to better serve the Metropolitan area trade in seamless tubing and alloy steel of all types. ARTHUR R. ADELBERG has been appointed district manager of sales in charge of the new office.

CARBORUNDUM Co., Niagara Falls, N. Y., is inaugurating its tenth successive year on the air. The fall and winter program series of band selections, played by the Carborundum Band, opened on October 19 and will continue through February.

JOHN D. SWAIN has been elected vice-president of the Electro Metallurgical Sales Corporation, a unit of the Union Carbide and Carbon Corporation of New York City. Mr. Swain was previously vice-president of the Linde Air Products

Here's Efficiency !



New "AGRIPPA" HOLDERS



LIGHT BORING TOOL: Handy and economical for all small work. Also suitable for threading and R & L Turning. Three sizes, Nos. 15, 16 and 17.



THREADING TOOL with Formed-Cutter: Accurate threads; cutter easily resharpened by grinding top edge only. Two sizes, Nos. C-50 and C-51.

WHEN you can leave the tool holder in the post and, by simply adjusting two bolts, slip in another size bar for a different boring operation... *that's efficiency.* No sleeves or bushings to get lost with Williams' "Agrippa" Boring Tools. No. 81 Holder (illustrated above) takes Bars from 1/4 to 3/4" . . for the smaller sizes, reverse the cap.

Throughout the complete line of "Agrippa" Tool Holders, you will find similar money-saving, production-boosting features, and in addition a quality of material and workmanship developed through more than 50 years of tool-making experience. Let us show you what Williams' Tools can do for you. Write for literature.

J. H. WILLIAMS & CO.

"The Drop-Forging People"

75 Spring Street

New York, N. Y.

WESTERN WAREHOUSE AND SALES OFFICE, CHICAGO — WORKS, BUFFALO, N. Y.

WILLIAMS
SUPERIOR DROP-FORGED TOOLS
"AGRIPPA"
TOOL HOLDERS
"THE HOLDERS THAT HOLD"



**John D. Swain, Vice-President
of Electro Metallurgical Sales
Corporation**

Co., and the Union Carbide Sales Co., other units of the parent organization. He has been actively connected with these units for twenty years. His offices will be located in the Carbide and Carbon Bldg., 30 E. 42nd St., New York City.

HERBERTS MACHINERY CO., LTD., Los Angeles, Calif., has established a special export department at 50 Church St., New York City, to take care of the company's increased number of foreign orders for light woodworking machinery of the "Wizard" line.

Ohio

JULES A. MORLAND has been appointed technical representative in South America of the Timken Roller Bearing Co., Canton, Ohio. His headquarters will be at the City Hotel, Buenos Aires, Argentina. Mr. Morland has been with the Timken organization since 1927, having been sales engineer in the railroad division. In addition to representing the Timken Roller Bearing Co., of the United States, he will represent the associated Timken organizations now established in other countries.

TIMKEN STEEL & TUBE Co., Canton, Ohio, announces an expansion in its Chicago and Detroit offices. DAVID T. MARVEL has been transferred from the Canton office to the Chicago office at 333 N. Michigan Ave., where he will act as sales representative and assistant to E. F. Talmadge. C. SIDLEY CRAINE, of the Canton office, will serve as sales representative and assistant to R. Atkinson in the Detroit office, Fisher Bldg.

LINCOLN ELECTRIC Co., Cleveland, Ohio, announces a number of five-day training courses in arc-welding design and practice for engineers, production managers,

welding supervisors, and foremen. The courses start December 2, 1935, and January 13, February 17, March 16, April 13, and May 11, 1936. For further information write the Lincoln Electric Co., Cleveland, Ohio.

HARRY W. McQUAID, of the metallurgical staff of the Republic Steel Corporation, Youngstown, Ohio, made an address on the subject "Metallurgical Aspects of Tractor Gear Sets" before the tractor and industrial power equipment meeting of the Society of Automotive Engineers held at the Palmer House, Chicago, Ill., on October 11.

CHARLES M. REESEY, advertising manager for the Cincinnati Milling Machine Co. and Cincinnati Grinders, Inc., Cincinnati, Ohio, has been elected president of the Cincinnati Association of Industrial Marketers, the local chapter of the National Industrial Advertisers Association.

GENERAL MFG. Co., 6430 Farnsworth Ave., Detroit, Mich., has appointed the CLEVELAND DUPLEX MACHINERY Co., Penton Bldg., Cleveland, Ohio, exclusive representative for the sale of the General flexible power presses and shaft straightening attachments in northeastern Ohio.

FRANK F. CHILES, formerly manager of sales of the Bar Division of the Corigan, McKinney Steel Co., has been appointed assistant manager of sales of the Bar Division of the Republic Steel Corporation, Youngstown, Ohio.

P. E. WELTON, of the Universal Engineering Corporation, Akron, Ohio, has been appointed special representative for the rubber industry of Foote Bros. Gear & Machine Co., Chicago, Ill.

Pennsylvania and Maryland

TRYGVE D. YENSEN, engineer in charge of the Magnetic Division of the Westinghouse Electric & Mfg. Co.'s Research Department, was awarded the Henry Marion Howe medal on October 3 at a banquet of the American Society for Metals held in the Palmer House, Chicago, Ill. The award was made jointly to Mr. Yensen and to N. A. ZEIGLER for a paper entitled "The Magnetic Properties of Iron as Affected by Carbon, Oxygen, and Grain Size," which was adjudged the best paper published in the Transactions of the American Society for Metals during the year 1934.

REPUBLIC STEEL CORPORATION announces that the Pittsburgh district sales office has been moved from 4th and Bingham Sts., S.S., to 1832 Oliver Bldg. F. M. WELSH continues in charge of the office. The Union Drawn Steel Co., a subsidiary of the Republic Steel Corporation, will move into an adjoining

suite in the Oliver Building. W. C. GULLYES, district sales manager, will be in charge.

REVERE COPPER & BRASS, INC., 1201 Architects Bldg., 17th and Sansom Sts., Philadelphia, Pa., have recently acquired the BALTIMORE TUBE Co., of Baltimore, Md. R. S. STRINGER, Philadelphia representative of the Baltimore Tube Co., is now connected with the Philadelphia sales office of Revere Copper & Brass, Inc., and will continue to handle the products of the Baltimore Tube Co. Division.

CLARK CONTROLLER Co., Cleveland, Ohio, has appointed the HARRIS-GREEN Co., Farmers Bank Bldg., Pittsburgh, Pa., sales-engineering representative of the company. The Pittsburgh branch office will also continue to be maintained.

AMERICAN HAMMERED PISTON-RING Co., Baltimore, Md., and the SKINNER CHUCK Co., New Britain, Conn., have consummated a contract through which the two companies will cooperate in the manufacture and sale of Gold Seal and Silver Seal piston-rings. For the last four years the Skinner Chuck Co. has been carrying on laboratory and field tests on rings with peripheral anti-friction metal inserts, in which the American Hammered Piston-Ring Co. has cooperated. These rings have been adopted as standard on Westinghouse Diesel engines and on Frick refrigerating machinery.

Texas

RAWLPLUG Co., INC., 98 Lafayette St., New York City, has just opened an office at 1907 Canton St., Dallas, Tex.; where a stock of the complete line of Rawl-plugs, Rawl-Anchors, etc., will be carried. The new branch will be known as the Rawlplug Dallas Co.

Wisconsin

REEVES PULLEY Co., Columbus, Ind., announces that the complete line of Reeves variable-speed control equipment is now distributed on the Pacific Coast from four branch offices of the Chain Belt Co., of Milwaukee, Wis., located at 1414 Santa Fe Ave., Los Angeles, Calif., 909 Harrison St., San Francisco, Calif., 215 S. W. First Ave., Portland, Ore., and 530 First Ave., S., Seattle, Wash. The Chain Belt offices will also carry stocks of complete Reeves transmissions and vari-speed motor pulleys, as well as replacement parts.

PETERS TOOL & MACHINE Co., 114 E. Scott St., Milwaukee, Wis., manufacturer of tools, dies, jigs, fixtures and special machines, announces that the name of the company has been changed to the PETERS TOOL Co., INC.

The new

CARBO-HYDRAULIC LATHE

for Faster Production

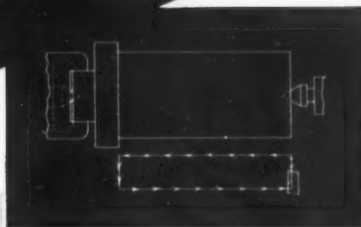
Features

1. Complete automatic cycle
2. Instant variable feed to carriage and facing attachment
3. Power cross feed
4. Tool relief 0" to 2"
5. Automatic starting and stopping of spindle
6. Quick tool set-up.

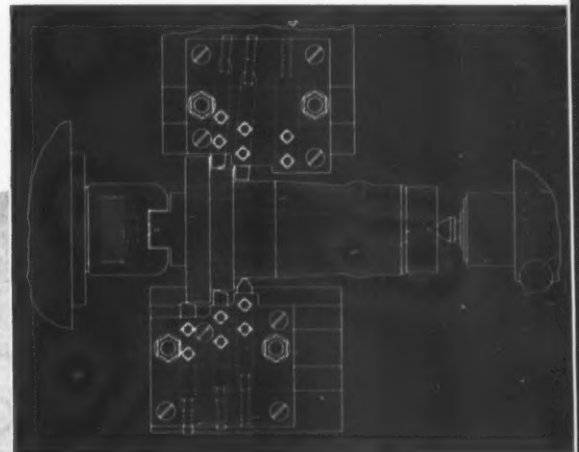
THIS new Carbo-Hydraulic-"Cycle" Lathe employs hydraulics because they make the "Cycle" feature possible which, in turn, lowers the unit cost for certain parts. This machine is thus particularly well adapted for the very rapid manufacture of such duplicate parts as pistons, piston rings, gear blanks, reamers, drills, studs, bolts or any other relatively short pieces.

In this advanced lathe the 3 hydraulic cylinders eliminate all gears, feed rods, feed screws, radii, pinions, cams, clutches, springs in feed mechanism. Other unique features are push button control, built in light, and—most important—ammeters, a glance at which tell the operator when his tool is dull and pulling too much power.

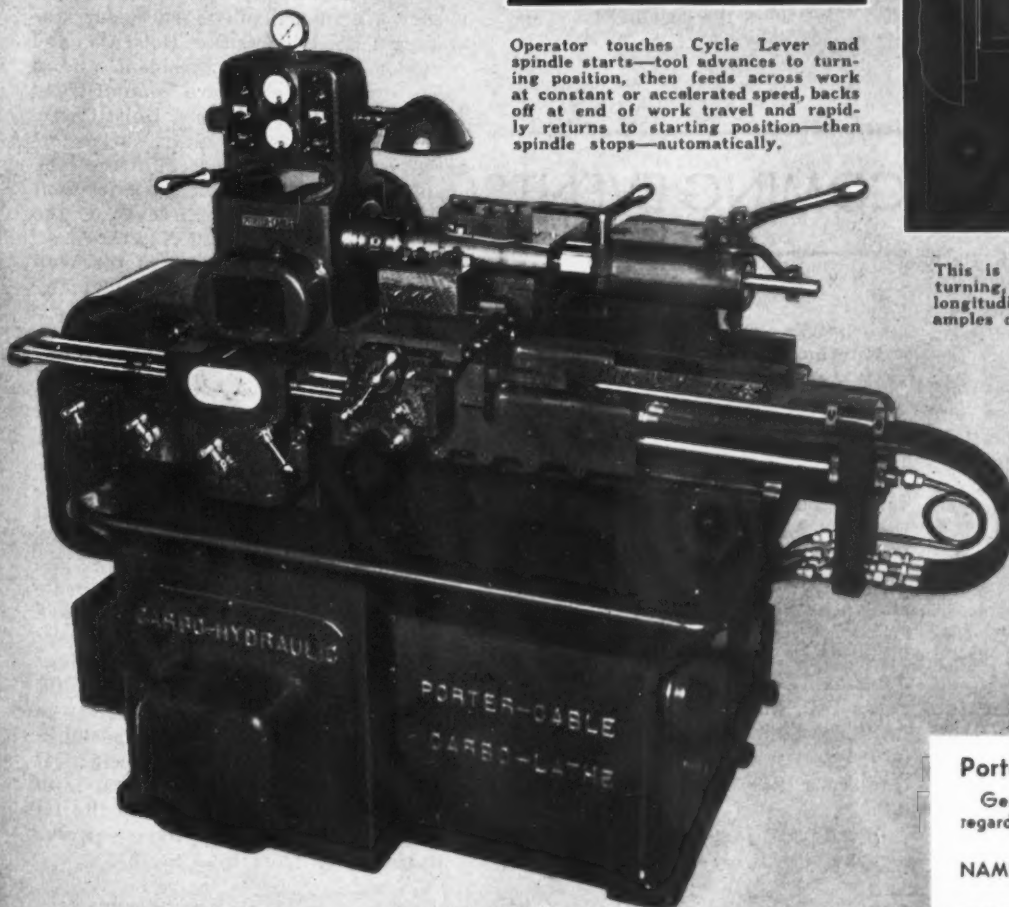
Our mechanically operated Carbo Lathe and the new Carbo-Hydraulic-"Cycle" Lathe beautifully complement each other giving the best solution of all short turning jobs. Submit your problem with blueprints for production and cost estimates. Send for literature.



Operator touches Cycle Lever and spindle starts—tool advances to turning position, then feeds across work at constant or accelerated speed, backs off at end of work travel and rapidly returns to starting position—then spindle stops—automatically.



This is a job which includes straight turning, taper turning, form turning, step turning to shoulder, to longitudinal accuracy of 0.001" and back facing. Examples of the versatility of the "Cycle" Carbo Lathe.



Get full details on this by clipping and returning the coupon below.

Porter-Cable Machine Co., Syracuse, N. Y.

Gentlemen: Please send me complete information regarding your New Carbo-Hydraulic Lathe.

NAME.....

POSITION.....

COMPANY.....

ADDRESS.....

PORTER-CABLE MACHINE CO.

Lathe Division, SYRACUSE, N. Y.

NEW BOOKS AND PUBLICATIONS

PROCEDURE HANDBOOK OF ARC WELDING DESIGN AND PRACTICE. 586 pages, 5 3/4 by 9 inches. 700 illustrations. Published by the Lincoln Electric Co., Cleveland, Ohio. Price, \$1.50.

This is a revised and enlarged edition of a handbook on arc welding. The present volume contains 140 more pages than the preceding edition. The book is encyclopedic in scope and covers practically every use and application of arc welding. There are eight principal sections dealing with the following subjects: Welding Methods and Equipment; Technique of Welding; Procedures, Speeds, and Costs for Welding Mild Steel; Structure and Properties of Weld Metal; Weldability of Metals; Designing for Arc-Welded Steel Construction of Machinery; Designing for Arc-Welded Structures; and Typical Applications of Arc Welding in Manufacturing, Construction, and Maintenance. The new material that has been added to the present edition includes American Welding Society Specifications for Filler Metal; Method of Determining the Amount of Current Carried by the Electrode; Procedures, Speeds, and Costs for Making all Types of Welds in Sheet Metal; A.S.M.E. Boiler Code Requirements for Butt Welds in Heavy Plate; Hard-Facing of Ferrous Metals; Examples of Redesigning for Arc Welding; Use of Arc Welding in Making and Repairing Cutting Tools and Dies; Speed of Welding Oil and Gas Pipe Lines. Designers, engineers, welding supervisors and operators, and all others interested in arc welding should find this book a valuable guide.

ELEMENTS OF MACHINE DESIGN. By Dexter S. Kimball and John H. Barr. 476 pages, 6 by 9 inches. Published by John Wiley & Sons, Inc., 440 Fourth Ave., New York City. Price, \$4, net.

This is the third edition of a work on machine design, which is the outgrowth of the experience of the authors in teaching machine design to engineering students in Sibley College at Cornell University. The book presupposes a knowledge of mechanism and of mechanics of engineering. It should be of value both to students and to practicing engineers. The text has been completely revised and brought up to date. New subject matter has been added where necessary but without increasing materially the size of the book. The text is divided into twenty chapters, dealing with the following subjects: Definitions and Fundamental Principles of Machine Design; The Energy and Force Problem; Straining Actions in Machine Elements; Friction, Lubrication, and Effi-

ciency; Constraining Surfaces—Journals and Bearings; Constraining Surfaces—Thrust Bearings, Roller and Ball Bearings; Axles, Shafting, and Couplings; Springs; Tubes, Pipes, Flues, Thin Plates; Riveted Fastenings; Screws and Screw Fastenings; Keys and Cotter Pins; Machine Fits; Toothed Gearing, Spur, Bevel, and Screw Gears; Belt and Rope Transmission; Chains and Chain Transmission; Applications of Friction; Flywheels, Pulleys, and Rotating Disks; Machine Frames and Attachments; and Balancing of Machine Parts.

THE METAL CLEANING HANDBOOK. By Robert W. Mitchell. 213 pages, 6 by 9 1/4 inches. Distributed by the Magnus Chemical Co., Inc., 48 South Ave., Garwood, N. J.

This book comprises a handy guide for those interested in or directly concerned with metal cleaning. It covers equipment, methods, and materials with practical suggestions for their use. Specific directions are given for cleaning various classes of metals, such as aluminum, brass, cadmium, chromium, die-casting metals, etc. A limited number of these books are available for free distribution among those engaged in metal cleaning who request a copy on a business letter-head, giving official title. To others the cost is \$1.

COMING EVENTS

NOVEMBER 12-15—Thirty-sixth annual convention of the **INTERNATIONAL ACETYLENE ASSOCIATION** at the Hotel Cleveland, Cleveland, Ohio. H. F. Reinhard, secretary, 30 E. 42nd St., New York.

NOVEMBER 18-20—Twenty-second **NATIONAL FOREIGN TRADE CONVENTION** of the National Foreign Trade Council in Houston, Tex. Secretary, Lindsay Crawford, National Foreign Trade Council, 26 Beaver St., New York City.

DECEMBER 2-6—Annual meeting of the **AMERICAN SOCIETY OF MECHANICAL ENGINEERS** at the Engineering Societies' Building, 29 W. 39th St., New York City. C. E. Davies, secretary, 29 W. 39th St., New York City.

DECEMBER 2-7—**FIFTEENTH EXPOSITION OF THE CHEMICAL INDUSTRIES** at the

Grand Central Palace, New York City. Charles F. Roth, manager, Grand Central Palace, New York.

JANUARY 13-17—Annual meeting of the **SOCIETY OF AUTOMOTIVE ENGINEERS** at the Book-Cadillac Hotel, Detroit, Mich. John A. C. Warner, secretary and general manager, 29 W. 39th St., New York City.

MARCH 10-14, 1936—**SIXTH PACKAGING EXPOSITION**, held under the auspices of the American Management Association at the Hotel Pennsylvania, New York City. Roberts Everett Associates, Inc., 232 Madison Ave., New York City, are the managers of the Exposition.

OBITUARIES

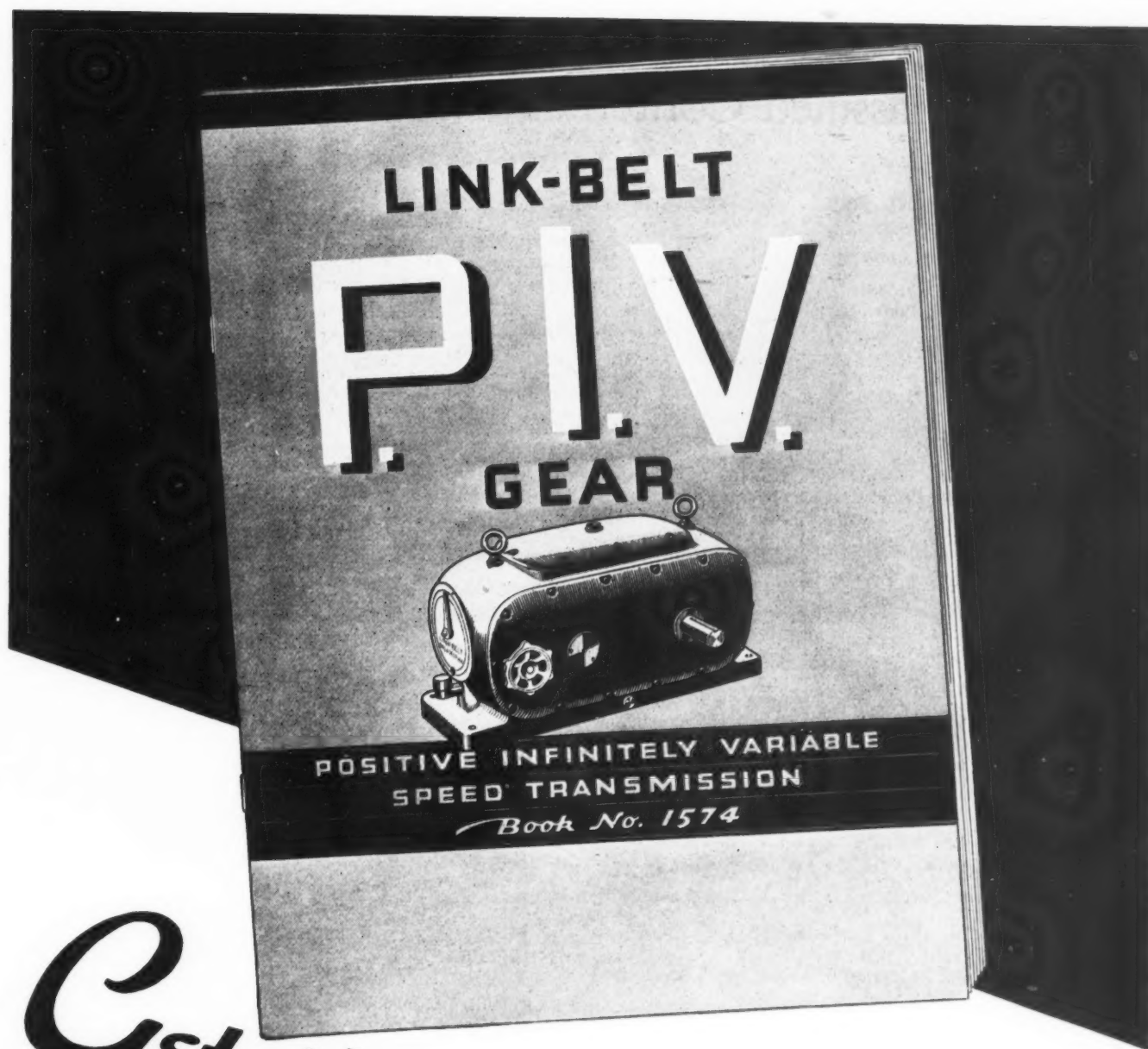
Frank A. Hatch

Frank A. Hatch, president of Shepard Niles Crane & Hoist Corporation, Montour Falls, N. Y., died at his home in Montour Falls on October 15. Mr. Hatch was born on November 2, 1877, in Bay City, Mich. He was graduated from the University of Michigan in 1900, and three years later went to Montour Falls as treasurer of the Pneumatic Tool Co. In 1917 he became vice-president and general manager of its successor, the Shepard Electric Crane & Hoist Co., and in 1929 was elected president and a member of the executive committee of the Shepard Niles Crane & Hoist Corporation. His ability as an executive was a large factor in the success of the company and in developing it to its present size. He was also a director of the Niles-Bement-Pond Co. of New York.

Mr. Hatch was president of the Watkins State Bank and a leader in many civic enterprises.

Frederick A. Halsey

F. A. Halsey, formerly editor of the *American Machinist*, died October 20 from heart disease in the Post Graduate Hospital, New York City, at the age of seventy-nine. Mr. Halsey was a graduate of Cornell University, class of 1878. Later, while engineer and general manager of the Rand Drill Co., he worked out the Halsey premium system of wage payment, which was one of the earliest planned wage incentive systems. Because of his work in this connection, he was awarded, in 1923, the gold medal of the American Society of Mechanical Engineers. For seventeen years, from 1894 to 1911, he was on the editorial staff of the *American Machinist* and was editor-in-chief from 1907 to 1911.



Get this **NEW LINK-BELT BOOK ON VARIABLE SPEED TRANSMISSION**

JUST off the press—this new 40-page book of facts and engineering data. The P.I.V. Gear assures continuously variable speed selection, positively, and while equipment is operating. No delay to obtain the correct—most efficient — operating speed. No loss of production. Speed changes instantly obtained.

Available in a wider range of sizes and in new combinations giving greater flexibility of applications:

- (1) Motorized (when desired), with motor form an integral part of the unit.
- (2) With or without speed reduction gearing.
- (3) With horizontal or vertical box.
- (4) And in sizes up to 15 H.P. capacity.

LINK-BELT COMPANY		5458
2045 W. Huntington Park Ave., Philadelphia, Pa. (or nearest office)		
Please send me a copy of P.I.V. Gear Book 1574.		
Name	Title	
Firm		
Address		
City	State	MACHINERY

Classified Contents of this Number

DESIGN, FIXTURE AND TOOL

- High-Speed Riveting Fixtures—
By William C. Betz 177
- Tool for Expanding Piston-Ring—
By Joseph Waitkus 199

DESIGN, MACHINE

- Large Allowances for Finish are Wasteful 186
- Combination Roller Clutch and Ratchet for Imparting Variable Rotary Movement—By J. E. Fenno 187
- Quick Return Crank Motion with Adjustment for Varying Velocity of Stroke—By F. E. Judson... 188
- How to Construct a Logarithmic Chart—
By W. F. Fischer 192
- Simplified Anti-Friction Bearing Mounting for Boring Mill Table 232-C

DIEMAKING, DIE DESIGN, AND PRESS WORK

- Die for Punching Four Equally Spaced Slots in Tubing—By Ben Clark 197
- Die for Blanking Two Pieces at Each Stroke—
By William C. Betz 199

INSPECTION AND TESTING

- A Swiss Cupping-Test Machine 189
- Fixture for the Accurate Testing of Eccentric Throw—By Fred B. Jacobs 199

LUBRICANTS AND LUBRICATION

- Do Not Jump at Conclusions about Lubricants... 176
- Lubrication Problems Require Thorough Study—
By A. F. Brewer 201
- Colloidal Graphite for Lamp Bases 232-C

MANAGEMENT PROBLEMS

- Higher Wages Depend on the Machine 180
- Let Us Have a Redistribution of Common Sense.. 184
- Reciprocal Buying is Not Always to be Recommended 186
- We Are All Helping to Pay—
By George P. Torrence 207

MATERIALS, METALS, AND ALLOYS

- Plaskon—A New Plastic Material 169
- Light-Weight Car Frame Shown at the Metal Exposition 208
- Stainless Steel Bars with Inserts of Low-Carbon Steel 208
- High Tensile Strength a Feature of a New Copper Alloy 208
- Thin-Wall Stainless Steel Tubing Now Made by Allegheny 209
- Alloy of Platinum and Rhodium Resists Hot Flowing Glass 209
- A New Alloy for the Production of Brass Die-Castings 209
- A New Molding Material that is Non-Bleeding.... 209
- Stainless Steel Now Used in Bronze Valves 209

NEWS OF INDUSTRY

- William L. Batt, New President of the A.S.M.E... 180
- Engineering News Flashes 190
- Gear Manufacturers' Semi-Annual Meeting 207

SHOP PRACTICE

- Finishing Zinc and Aluminum Die-Castings—
By Herbert Chase 181
- Marking on Metal Toys—By Phil. E. Veraa 185
- The Possibilities of the Metal-Spraying Process... 186
- Method that Insures Boring Split Bearings on Exact Center Line—By Charles C. Tomney 198
- Surface Hardening for Bearing Purposes—
By Christopher H. Bierbaum 204
- Shop Equipment News 213
- Giant Variable-Speed Transmission 232-C

WELDING AND CUTTING PRACTICE

- Welding Machines for Assembling Automobile Parts—By C. M. Taylor 175
- Fabricated Versus Cast Carburizing Boxes 185
- Savings by Copper-Brazing Process 196
- Forming Bosses by Welding—By John E. Hyler.. 198
- Increasing Importance of Flame Cutting 200

Your Progress Depends Upon Your Knowledge of Your Industry

Classified Contents of this Number

DESIGN, FIXTURE AND TOOL

- Tool for Cutting Holes in Thin Sheets—
By William M. Halliday..... 260
- Jig with Quick-Acting Clamping Nut of Slotted
Type—By Charles C. Tomney..... 274
- Stepped Vise Fittings Serve as Substitute for Par-
allels of Different Heights—By Peter Budwitz.. 274

DESIGN, MACHINE

- Geneva Stop Mechanisms of Modified Design—
By Paul Grodzinski..... 251
- Mechanism for Driving Two Shafts Intermittently
and Alternately—By R. H. Holton..... 252
- Oscillating Arm Mechanism for Rapid Reciproca-
tion of Slide—By J. E. Fenno..... 253
- Electric Drives Facilitate Machine Tool Operation
—By R. S. Elberty..... 254

DIEMAKING, DIE DESIGN, AND PRESS WORK

- Small Aluminum Die-Castings Made in Machines
of Simple Design—By Charles O. Herb..... 244
- Dies for Producing Pierced and Formed Parts
from Strap Stock—By C. W. Hinman..... 258
- Swaging Dies Supplant Hand-Chasing for Finish-
ing Non-Ferrous Castings—By William C. Betz 259

GAGING AND INSPECTION

- Special Gaging Equipment for Compressor Crank-
shaft—By Charles C. Tomney..... 257
- Gage for Checking Shoulder Length on Stud—
By J. B. Booth..... 260

MANAGEMENT PROBLEMS

- The Effect of Fatigue on Output..... 240
- Cost Reduction Efforts Must Not be One-sided... 250
- It Takes a Good Man to Know When to Slight
Work 250
- It is not Enough that it Works—It Must Sell.... 250
- Plans for Compensating Salesmen..... 256
- Machinery Institute and Automobile Association
Oppose Revival of NRA..... 271

MATERIALS, METALS, AND ALLOYS

- Non-Porous Protective Coatings for Metal and
Non-Metallic Surfaces 239
- Directions for Ordering Malleable Castings..... 256
- Motion Picture Film Tells the Story of Nickel... 256
- The Hardness of Chromium Plate Its Chief Value
in Industry 272
- A Free-Machining Stainless Steel Developed by
U. S. Steel 272
- Bakelite Resins Find New Applications..... 273
- Synthetic Rubber Replaces Metal Springs in
Water Pumps 273
- One Hundred Tons of Stainless Steel Used on the
Normandie 273

NEWS OF INDUSTRY

- Bakelite Corporation Commemorates Twenty Fifth
Anniversary of a New Industry..... 247
- Engineering News Flashes..... 248
- Machine Tool Builders' Association Elects New
President 271
- News of the Industry..... 292

SHOP PRACTICE

- Modern Astronomy Relies on the Machine Shop—
By Charles O. Herb..... 233
- Smoke-Pipe Elbows Made by Quantity-Production
Methods 239
- Machining Pistons for the New Buick..... 261
- The Grinding of Milling Cutters—By A. H. Prey... 265
- Cemented-Carbide Cutting Tools in Present-Day
Shop Practice—By Roger D. Prosser..... 268
- Shop Equipment News..... 277

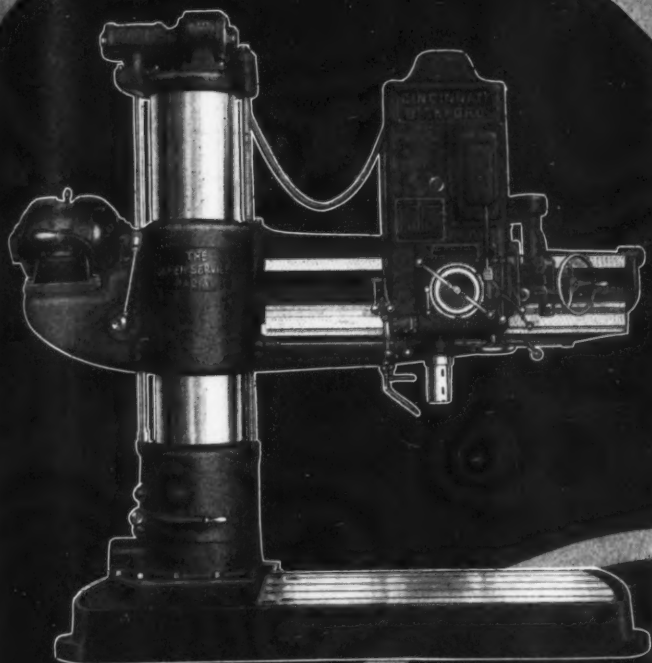
WELDING PRACTICE

- The Increasing Use of Resistance Welding..... 241
- Welding Machine Performs Six Operations in
Fabricating Transformer Cooling Tubes..... 243
- Welding Facilitates Fabrication of Small Racing
Cars 247
- New Spot-Welder for Experimental and Develop-
ment Work 270

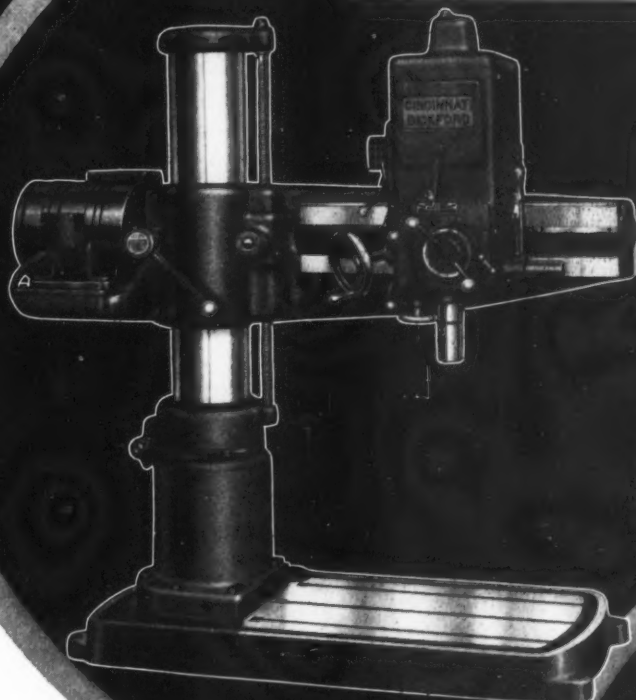
Your Progress Depends Upon Your Knowledge of Your Industry

Avoid Profitless Prosperity

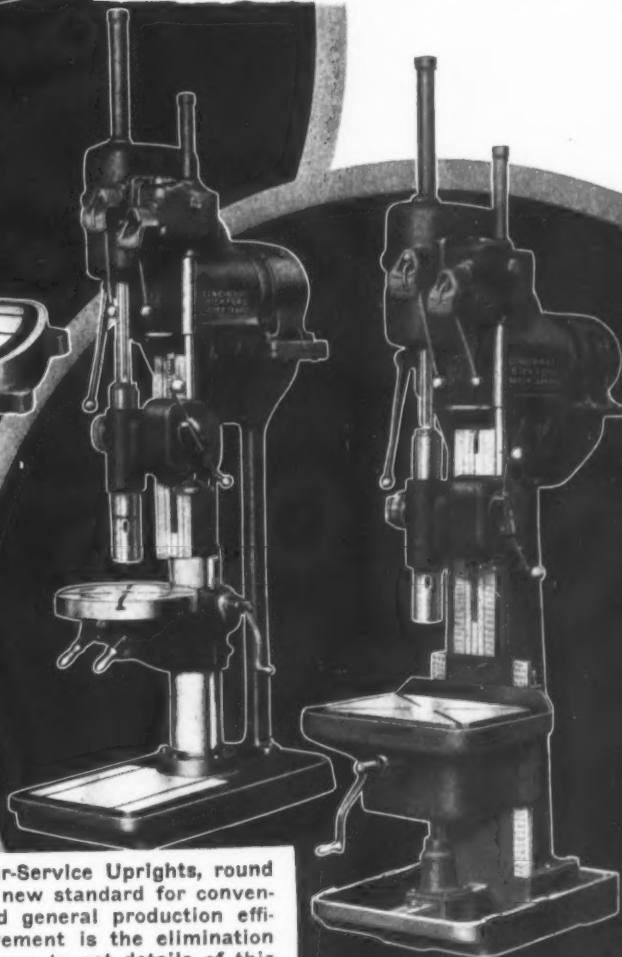
Here's New Efficiency for Your Drilling Departments



NEW low controls centralized 100% at the operating position are featured on the line of Super-Service Radials shown at the left. All sizes, from the 3' machine with 11" diameter column to the powerful 12' arm machine having 26" diameter column, incorporate new improvements that will save money in your drill department.



NEW High Speed 3' and 4' Super-Service Radials will provide a speed range to suit your work no matter how small your drilling. All speeds and feeds changed by sliding gears with single lever control at the head. Balanced head and arm move on antifriction bearings for the ultimate in fast, easy handling.



NEW 21", 24" and 28" Super-Service Uprights, round and box column types, set a new standard for convenience, stamina, accuracy and general production efficiency. One modern improvement is the elimination of all friction clutches. Be sure to get details of this new design.

The most important machines in your shop include your radial and upright drills. New savings are possible with the recent Cincinnati Bickford developments. Features to give you "more holes per dollar" should be working for you now. Write for our latest catalogs.

The Cincinnati Bickford Tool Company
Oakley, Cincinnati, Ohio, U. S. A.

OBITUARIES

E. W. Rice, Jr.

Edwin Wilbur Rice, Jr., honorary chairman of the board of directors of the General Electric Co., Schenectady, N. Y., died at his home in Schenectady on November 25, after a long illness, at the age of seventy-three. He was one of the pioneers of electrical development in the United States, and in association with the late Charles A. Coffin, played a conspicuous part in the building up of the General Electric Co.

Mr. Rice was born in La Crosse, Wis., on May 6, 1862. In 1876, he moved to Philadelphia, where he came in contact with Professor Elihu Thomson, then a teacher in the Boys' Central High School. His natural fondness for mechanics and electricity was quickly developed by this association, so that when Professor Thomson gave up teaching to go into electrical manufacturing, in 1880, young Rice gladly accepted an opportunity to become his assistant. He went to New Britain, Conn., and for three years was associated with Professor Thomson in the American Electric Co., engaged in the manufacture of arc lamps and dynamos.

In 1883, he went with Professor Thomson to Lynn, Mass., upon the organization of the Thomson-Houston Co. At the age of twenty-two he was made plant superintendent, which position he held until the Thomson-Houston Co. and the Edison General Electric Co. were consolidated, in 1892, to form the present General Electric Co.

In the new company he was first made technical director and, in 1896, vice-president in charge of manufacturing and engineering. Subsequently he became senior vice-president, and in 1913, succeeded Mr. Coffin as president of the company. In 1922, he was made honorary chairman of the board.

He contributed much through organization methods, improved factory routine, technical development, and engineering and scientific inventions to the pre-eminence attained by the General Electric Co., having more than a hundred patents to his credit. He promoted many methods of advancing employees' welfare, and practically created the company policy of employees' representation and recognition of the shop workers' part in the success of the corporation.

Mr. Rice was president of the American Institute of Electrical Engineers in 1917, and received the 1931 Edison medal from that organization for his contributions to the development of electric systems and his encouragement of scientific research in industry. He was a member of the Institution of Civil Engineers of England, of the English Institution of Electrical Engineers, and of the Society of Illuminating Engineers.

Albert Heber McIntire

Albert Heber McIntire, who for twenty-three years was editor and manager of the *Electric Journal*, died of pneumonia at his home in Pittsburgh on November 4. Mr. McIntire was born on August 13, 1876. He received the degree of E.E. from Ohio State University in 1898 and the degree of M.E. in 1900. He had an extensive experience with the manufacture of Corliss engines, with an electric railway company, and with an electrical contractor, as well as test floor experience with both the General Electric Co. and the Westinghouse Electric & Mfg. Co., which gave him a broad background for his editorial work.

Robert Tiff Turner

Robert Tiff Turner, vice-president and general sales manager of the Shepard Niles Crane & Hoist Corporation, Montour Falls, N. Y., died in New York City on November 13. Mr. Turner was born in Elmira, N. Y., on August 5, 1886. He graduated from Cornell University in 1906, and later studied business administration at Harvard University. On March 1, 1917, he joined the Shepard Electric Crane & Hoist Co. and was elected secretary of the company in 1927, also being appointed general sales manager the same year. In 1929 he was elected vice-president.

R. L. HILL, sales engineer of the Union Drawn Steel Co., Massillon, Ohio, was killed in an automobile accident on December 3. Prior to his connection with the Union Drawn Steel Co., Mr. Hill had been associated with the Willys-Morrow Co., Elmira, N. Y., for sixteen years and had also been connected with the National Acme Co. of Cleveland, Ohio.

CALENDARS RECEIVED

NEW DEPARTURE MFG. Co., Bristol, Conn.

GENERAL ELECTRIC Co., Schenectady, N. Y.

CARBORUNDUM Co., Niagara Falls, N. Y.

LINK-BELT Co., Chicago, Ill.

* * *

In their effort to reduce costs and improve quality, manufacturing executives the country over have worked in close cooperation with the machine tool builders; and it is largely because of such cooperation that American industry has achieved such remarkable results—results that not even the most far-seeing engineers dared to predict even fifteen or twenty years ago.

COMING EVENTS

JANUARY 13-17—Annual meeting of the SOCIETY OF AUTOMOTIVE ENGINEERS at the Book-Cadillac Hotel, Detroit, Mich. John A. C. Warner, secretary and general manager, 29 W. 39th St., New York City.

JANUARY 14—Meeting of the Hudson River Valley Division of the SPECIAL TOOL, DIE & MACHINE SHOP INSTITUTE at 7:30 P.M. at Hotel Pennsylvania, New York City.

MARCH 10-14—SIXTH PACKAGING EXPOSITION, held under the auspices of the American Management Association at the Hotel Pennsylvania, New York City. Roberts Everett Associates, Inc., 232 Madison Ave., New York City, are the managers of the Exposition.

APRIL 6-11—SOUTHERN INDUSTRIAL SHOW—an exhibition of machinery, power installations, mechanical equipment, accessories and supplies to be held in Textile Hall, Greenville, S. C. William G. Sirrine, president, Greenville.

APRIL 20-24—MIDWEST ENGINEERING AND POWER EXPOSITION, to be held in the International Amphitheatre, 43rd and Halsted St., Chicago, Ill. Exposition management, 1 N. LaSalle St., Chicago.

APRIL 20-25—SEVENTH ANNUAL OIL EQUIPMENT AND ENGINEERING EXPOSITION, to be held in Convention Hall, Houston, Tex. E. G. Lenzner, general manager, P. O. Box 490, Houston, Tex.

MAY 4-7—Convention of the American Foundrymen's Association at Detroit, Mich. For further information, address the Association, 222 W. Adams St., Chicago, Ill.

MAY 4-9—FOUNDRY AND ALLIED INDUSTRIES EXPOSITION to be held in Convention Hall, Detroit, Mich., in connection with the fortieth annual convention of the American Foundrymen's Association. For further information, address American Foundrymen's Association, 222 W. Adams St., Chicago, Ill.

* * *

A Treatise on Currency

"Debasing the Currency" is the title of a booklet written by E. S. Pillsbury, president of the Century Electric Co., St. Louis, Mo. This booklet states some of the fundamental facts pertaining to money, currency, prices, and wages, and contains numerous charts on industrial production, business activity, prices, etc. The book is sent free of charge to anyone interested, by the Century Electric Co., 1806 Pine St., St. Louis, Mo.

A Plan *to let new equipment pay for itself out of earnings*

THE long-term, low-rate financing now available through the use of Equipment Acceptance Corporation Credit, offers you the opportunity of carrying out an improvement, alteration and modernization program without impairing your working capital.

Our booklet explains in simple language the eligibility requirements and procedure for obtaining this credit.

Hundreds of progressive manufacturers of machinery and equipment are now providing this F. H. A. Modernization Credit to their customers through us. Remember, the Government does not intervene in any manner in the negotiation and extension of this credit. If you are interested in purchasing new machinery and equipment with this long-term credit, send us the coupon today.

F. H. A. CREDIT APPLIES TO—

machine tools
pattern-making machines
metal working machines
woodworking machines
chemical machinery
power drills, punches

also turbines, pumps
air conditioning
sprinkler systems
dynamamos, engines
Diesel engines
conveyors, etc.

Credit up to \$50,000 to purchase new Machinery and Equipment.

New low rates—5% discount on 12 equal monthly instalments, with a maximum of 5 years to pay.

Equipment Acceptance Corporation is duly qualified to offer this credit service.

F.H.A. MODERNIZATION
CREDIT
AND HOW TO OBTAIN IT

*Send for your Copy
Today*

EQUIPMENT ACCEPTANCE CORPORATION
A Unit of COMMERCIAL INVESTMENT TRUST CORPORATION
1 Park Avenue, New York City
CAPITAL AND SURPLUS OVER \$100,000,000

Without obligating myself in any way, I wish a copy of your booklet "F.H.A. Modernization Credit And How To Obtain It."



Will you please advise me. I am considering the purchase on F. H. A. Terms of new equipment, such as:

estimated cost

FIRM NAME

ADDRESS

Classified Contents of this Number

DESIGN, FIXTURE AND TOOL

- Tool for Boring Large Spherical Cavities—
By H. C. Seegers 323
- Lengthening the Life of Drill Bushings—
By W. G. Holmes 328

DESIGN, MACHINE

- It Pays to Make a Thorough Study of Customer's Needs 314
- Pneumatic Overload Relief Mechanism for Disengaging Clutch at Remote Point—*By J. E. Fenno* 315
- Mechanism for Preventing Creep of Wire-Mesh Conveyor Belt—*By F. E. Judson* 316
- Nine-Speed Gear-Box with Single-Lever Control—*By Paul Grodzinski* 317
- Making Black-Line Reproductions of Blueprints—*By W. F. Schaphorst* 328
- Barber-Colman Single-Piece Hob Patents 333
- Influence of Manufacturing Requirements on Tool Development 333
- Reducing Machine Vibrations 355

DIEMAKING, DIE DESIGN, AND PRESS WORK

- Disk-Piercing Die with Automatic Indexing Mechanism—*By George L. Pyritz* 324
- Metal-Faced Rubber Stripper for Piercing Punch—*By William Steuer* 326

EDUCATION, TRADE AND ENGINEERING

- Pressed Metal Engineering and Die Design—A New College Course 304
- Apprentice Training—An Urgent Job for American Industry 310
- Engineering Schools Should not Educate Specialists 314
- Welding School Well Attended 355

FORGING AND HEAT-TREATING

- Common Causes of Gear Failures 302
- Test Blocks for Furnace Temperatures—*By R. C. Deale* 327
- Gas Furnaces for a Forging Plant 332

MANAGEMENT PROBLEMS

- A Machine Tool Replacement Program that Pays Dividends—*By H. Goldberg* 309
- Materials-Handling Equipment as a Means of Reducing Costs 314
- How Can America Regain Prosperity?—*By Ralph E. Flanders* 329
- Cost of Operating Business Automobiles 333

MATERIALS, METALS, AND ALLOYS

- New Applications of Nickel Steels and Alloys 318
- Motion Picture of Stainless Steel 320
- Two New Phenolic Plastics that Meet Special Needs 336
- 3200 Feet of Steel Tubing to the Pound 336
- Selecting Materials for Gas Engine Cylinders 336
- Rubber Plays an Important Part in the New Automobiles 337
- Cadmium-Nickel Alloy for High-Speed Motors 337
- Hot or Cold Materials Marked by Paint in Stick Form 337
- Alnico—A Permanent-Magnet Alloy Having Unusual Power 337

MEETINGS AND EXPOSITIONS

- Leipzig Engineering Fair to be Held in March 320
- Industrial Exposition in Cleveland Next Summer.. 322

NEWS OF INDUSTRY

- Marked Activity in the British Machine Tool Industry 311
- Engineering News Flashes 312
- Oakite Products Increases Jobs by the Use of Machinery 331
- Westinghouse Electric Celebrates Fiftieth Anniversary 334
- Canadian Duties on Machinery Reduced 355
- Eighty-Ninth Birthday of Ambrose Swasey 355
- A By-Product of Acetylene Generators 356
- Air-Conditioning of Industrial Offices 356

SHOP PRACTICE

- The Grinding of Milling Cutters—*By A. H. Prey*.. 305
- Precision Turning and Boring of Air-Brake Valves—*By C. A. Birkebak* 321
- Purolator Filters Used in Chain Manufacture.... 326
- Over-Lubrication of Electric Motors 327
- Toolmaker's Surface Plate Set at Convenient Height—*By Fred B. Jacobs* 328
- Shop Equipment News 341
- Air Filter Removes Oil Fumes in Sand-Blasting... 355
- A New Rustproofing Development 355

WELDING PRACTICE

- When is Resistance Welding Applicable?—*By M. L. Eckman* 297
- Steel Castings for Welded Structures 327
- Using Carbon Rods, Plates, and Paste to Facilitate Welding 356

Your Progress Depends Upon Your Knowledge of Your Industry

OBITUARIES

Frederick R. Low

Frederick Rollins Low, past-president of the American Society of Mechanical Engineers, for forty-two years editor of *Power*, and a former mayor of Passaic, N. J., died January 22 at his home in Passaic, after an illness of four years. He was seventy-five years old.

Mr. Low was one of the best known engineers in the steam power field in this country. Back in the eighties he made several inventions applying to the power plant field and organized a company for their exploitation. In 1886, he became editor of the engineering department of the *Journal of Commerce* in Boston. In 1888, he came to New York, becoming editor of *Power*, which position he held until he retired in 1930.

He was elected a vice-president of the American Society of Mechanical Engineers in 1918 and was president of that Society in 1924. In the same year, he received the honorary degree of Doctor of Engineering from the Rensselaer Polytechnic Institute, and was a delegate to the World's Power Conference in London.

He had a large part in bringing about the enactment of safety laws which reduced the number of boiler explosions. He was active on the Boiler Code Committee of the A. S. M. E. which codified the safety rules for the construction and testing of steam boilers and other pressure vessels, and which code has been incorporated in the laws of more than a score of states throughout the country. He was also the author of several well-known works on steam engineering.

Mr. Low is survived by his widow, Adeline Giles Low, four children, fourteen grandchildren, and two great grandchildren.

Endowed with a kind and understanding personality, Mr. Low made friends with all those who came in close contact with him. He was one of the most respected, beloved, and honored men in his profession.

William MacGregor

William MacGregor, general sales manager of the Carborundum Co., Niagara Falls, N. Y., died on December 18, after a prolonged illness, at the Poly-clinic Hospital in New York City.

Mr. MacGregor was born in Kemney, Aberdeenshire, Scotland, on October 5, 1888. After his schooling at Aberdeen, he joined the organization of his uncle, William MacGregor, in the manufacturing and manufacturing agency business at Airdrie. In 1912 he came to the United States and joined the sales staff of the Carborundum Co. He became a general sales representative of the abrasive paper and cloth department in



William MacGregor

1918, and was later appointed sales manager of that department and of the stone and marble department. In August, 1926, following the death of William W. Sanderson, he was appointed general sales manager of the company.

Mr. MacGregor had a host of friends throughout the country. He was regarded as one of the most progressive and popular of the younger sales executives in the country.

Harry B. Hurlburt

Harry B. Hurlburt, for eighteen years *MACHINERY's* subscription field manager in the Ohio and Michigan territories, died December 28 of heart failure. Mr. Hurlburt was born in Rushville, N. Y., in 1882 and went to Buffalo at an early age. He was there employed by the



Harry B. Hurlburt

Federal Telephone Co. and later went with the Cleveland Telephone Co. in Cleveland, Ohio. In 1917 he became associated with *MACHINERY*.

Mr. Hurlburt was a man of unusual ability in his chosen work. He leaves a host of friends throughout the territory that he served who will greatly regret to learn of his death. Mr. Hurlburt is survived by his wife.

J. G. Obermier

J. G. Obermier, vice-president in charge of production and a member of the board of directors of the Timken Roller Bearing Co., Canton, Ohio, died of pneumonia in Tucson, Ariz., on December 28.

Mr. Obermier was born in Cleveland on November 13, 1868. After working for a number of years in Cleveland he went to Canton, Ohio, and in 1912, joined the Timken organization as superintendent of production. He was in active charge of production through the intensive development period of the company, being personally responsible for many of the plant efficiencies that have played an important part in the growth of the organization. In 1921 Mr. Obermier was elected to the board of directors and appointed vice-president in charge of production.

ESKIL BERG, prominent retired engineer of the General Electric Co., and one-time associate of the late Dr. Charles P. Steinmetz, died at his residence at Ballston Lake, N. Y., on January 5.

Mr. Berg was born in Sweden, and immediately after graduation from the Chalmers Institute of Technology at Gothenburg, Sweden, came to this country and became associated with the General Electric Co. For many years, he worked with Dr. Steinmetz, and after Dr. Steinmetz' office had been discontinued, he became an associate of W. R. Emmet and was connected with work on the steam turbine, on the development of electric ship propulsion and on the mercury turbine.

WILLIAM W. MILLER, manager of the General Electric Co.'s Industrial Department, died in Schenectady on December 22, following an operation for appendicitis, at the age of fifty-five years.

Mr. Miller was born in Rochester, N. Y., in 1880. Upon graduating from the Union Classical Institute in 1897, he obtained a position with the General Electric Co. In 1900, he entered the student engineering course, and in 1902 was placed in the power and mining department, which later became the industrial department. In 1920, he was made assistant manager of the industrial department, and in 1929, was made manager, which position he held at the time of his death.

JACK ESPEN, a member of the firm of Espen-Lucas Machine Works, Philadelphia, Pa., died on December 22.

-A



B.S

The new
Electrically Controlled

1936 PRODUCTION LEADER . . .

*particularly
advantageous for milling with
formed cutters in steel.*

- ⚡ Complete electrical control of table and spindle movements.
- ⚡ Automatic backlash eliminator on table feed screw permits "climb" milling.
- ⚡ Dual table feed rates, automatically controlled.
- ⚡ New rapidity of set-up.
- ⚡ Unusually complete ranges of feeds and speeds.
- ⚡ Automatic reverse in cutting feed.

Capacity—Longitudinal Feed of Table, 18". Transverse Adjustment of Spindle, 3¼". Vertical Adjustment of Spindle Head, 6½". 18 Changes of Spindle Speed, 40 to 1050 R.P.M. 28 Rates of Table Feed, ½" to 35" per Minute.

BROWN & SHARPE No. 12 PLAIN MILLING MACHINE

Investigate this compact, powerful manufacturing type milling unit, capable of establishing new production rates on both long and short run work . . . May we send details?

**Brown & Sharpe
Mfg. Co.**

Providence, R. I., U.S.A.

NEW BOOKS AND PUBLICATIONS

PRACTICAL SHOP MATHEMATICS. By John H. Wolfe and Everett R. Phelps. 628 pages, 5 by 8 inches. Published by the McGraw-Hill Book Co., Inc., 330 W. 42nd St., New York City. Price, \$2.20.

This is the second volume of a work on shop mathematics which is based on a course in this subject taught by John H. Wolfe at the Ford Apprentice School of the Ford Motor Co. The present volume treats of advanced mathematics. To understand this book, the pupil must possess a knowledge of fractions, decimals, geometry, and elementary plane trigonometry, and their application to shop problems, as treated in the first volume. The material on compound angles presented in the second volume is published, it is believed, for the first time in book form. The subjects covered in this volume are as follows: Compound Angles; Screw Threads; Gears; Gear Ratios and Lead-Screws; Planetary Gearing; Plain and Differential Indexing; and Combining Fractions and Continued Fractions.

TURNING AND BORING PRACTICE. By Fred H. Colvin and Frank A. Stanley. 453 pages, 6 by 9 inches. Published by the McGraw-Hill Book Co., Inc., 330 W. 42nd St., New York City. Price, \$4.

This book treats of the operations performed in modern turning and boring practice and the machines used. It is intended to serve as a guide for everyone concerned with the use of these machines, from shop executives to apprentices. The essential principles and major problems involved in these operations are described, as well as all of the more important types of machines. The book is divided into five sections dealing with engine lathes; turret and semi-automatic lathes; automatic screw machines; boring machines; and cutting tools for different materials. The latter section includes the use of coolants.

A.S.T.M. TENTATIVE STANDARDS FOR 1935. 1591 pages, 6 by 9 inches. Published by the American Society for Testing Materials, 260 S. Broad St., Philadelphia, Pa. Price to non-members, \$7, paper-bound; \$8, cloth-bound.

This is the 1935 annual edition of the tentative standards of the Society, covering ferrous metals, non-ferrous metals, non-metallic minerals, miscellaneous materials, and general testing methods. It contains 290 tentative specifications and recommended practices covering the materials of engineering and the allied testing field. The volume also includes proposed revisions of standards.

OPERATION STUDY. 20 pages, 8 1/2 by 11 inches. Published by the Policyholder's Service Bureau of the Metropolitan Life Insurance Co., 1 Madison Ave., New York City.

This booklet contains a report prepared by the Policyholder's Service Bureau of operation study, giving an account of the prevailing practices in manufacturing organizations with reference to motion and time studies. It outlines the purposes and limits of such studies, and contains a detailed account of various techniques in current use. Job standardization and reports for control are also discussed.

MECHANICAL WORLD YEAR BOOK (1936). 360 pages, 4 by 6 inches. Published by Emmott & Co., Ltd., 31 King St., West, Manchester, England. Price, 1/6.

This is the forty-ninth edition of a well-known little handbook for mechanical engineers. The present edition has been revised and brought up to date. Included in the new material is a section dealing with the strength of tubes, cylinders, and pans for steam heating systems. Otherwise, the general scope and arrangement of the book is the same as in previous editions.

AN EXTENSOMETER COMPARATOR. By Ambrose H. Stang and LeRoy R. Sweetman. 6 pages, 6 by 9 inches. Published by the U. S. Department of Commerce, Washington, D. C., as Research Paper RP822 of the National Bureau of Standards. Price, 5 cents.

COMING EVENTS

FEBRUARY 8—Annual meeting of the **FOUNDRY EQUIPMENT MANUFACTURERS ASSOCIATION** at the Hotel Cleveland, Cleveland, Ohio. Arthur J. Tuscany, executive secretary, 1213 W. 3rd St., Cleveland, Ohio.

FEBRUARY 27-28—Fourth annual **FOUNDRY PRACTICE CONFERENCE** to be held in Birmingham, Ala., under the auspices of the Alabama Section of the American Society of Mechanical Engineers in co-operation with the American Foundrymen's Association. Joseph W. Eshelman, chairman, 1220 American Traders Bank Bldg., Birmingham, Ala.

MARCH 3-5—Seventh annual **GREATER NEW YORK SAFETY CONFERENCE** at the Hotel Astor, New York City. For further information, address Greater New York Safety Conference, 9 E. 41st St., New York City.

MARCH 3-6—Sixth **PACKAGING EXPOSITION**, held under the auspices of the American Management Association at the Hotel Pennsylvania, New York City. Roberts Everett Associates, Inc., 232 Madison Ave., New York City, are the managers of the Exposition.

MARCH 4—Regional meeting of the **AMERICAN SOCIETY FOR TESTING MATERIALS** at the Hotel William Penn, Pittsburgh, Pa. R. E. Hess, assistant secretary, 260 S. Broad St., Philadelphia, Pa.

APRIL 6-11—**SOUTHERN INDUSTRIAL SHOW**—an exhibition of machinery, power installations, mechanical equipment, accessories and supplies to be held in Textile Hall, Greenville, S. C. William G. Sirrine, president, Greenville.

APRIL 20-24—**MIDWEST ENGINEERING AND POWER EXPOSITION**, to be held in the International Amphitheatre, 43rd and Halsted St., Chicago, Ill. Exposition management, 1 N. LaSalle St., Chicago.

APRIL 20-25—Seventh annual **OIL EQUIPMENT AND ENGINEERING EXPOSITION**, to be held in Convention Hall, Houston, Tex. E. G. Lenzner, general manager, P. O. Box 490, Houston, Tex.

MAY 4-7—Convention of the **AMERICAN FOUNDRYMEN'S ASSOCIATION** at Detroit, Mich. For further information, address the Association, 222 W. Adams St., Chicago, Ill.

MAY 4-9—**FOUNDRY AND ALLIED INDUSTRIES EXPOSITION** to be held in Convention Hall, Detroit, Mich., in connection with the fortieth annual convention of the American Foundrymen's Association. For further information, address American Foundrymen's Association, 222 W. Adams St., Chicago, Ill.

JUNE 29-JULY 3—Thirty-ninth annual meeting of the **AMERICAN SOCIETY FOR TESTING MATERIALS** at the Chalfonte-Haddon Hall Hotel, Atlantic City, N. J. R. E. Hess, assistant secretary, 260 S. Broad St., Philadelphia, Pa.

OCTOBER 19-23—**NATIONAL METAL CONGRESS**, sponsored by the American Society for Metals, the American Welding Society, the Wire Association, the Institute of Metals and the Iron and Steel Divisions of the American Institute of Mining and Metallurgical Engineers, to be held in the Cleveland Public Auditorium, Cleveland, Ohio.

OCTOBER 19-23—Annual **METAL EXPOSITION** to be held in the Public Auditorium, Cleveland, Ohio, under the auspices of the American Society for Metals. W. H. Eisenman, secretary, American Society for Metals, 7016 Euclid Ave., Cleveland, Ohio, managing director of the exposition.

HARDINGE



HARDINGE "CATARACT" PRECISION BENCH LATHE UNIT WITH PRELOADED BALL BEARINGS

ACCURACY—HIGH SPEED—FINE FINISH

ASK FOR BULLETIN B1 TO GET FULL DETAILS ON THIS MODERN UNIT

HARDINGE BROTHERS, Inc., ELMIRA, N.Y.
CHICAGO — NEW YORK — DETROIT

MACHINERY, February, 1936—67

Classified Contents of this Number

DESIGN, FIXTURE AND TOOL

- Radius Grinding Fixture for Milling Cutters—
By *Ralph R. Weddell* 385

DESIGN, MACHINE

- Reciprocating Slide with Cam Mechanism for Operating Tool or Drill Slide—By *John A. Honegger* 379
Adjustable Feed Mechanism—By *L. Kasper* 379
Chain Feed Mechanism with Periodically Accelerated Motion—By *Paul Grodzinski* 380
Mechanism for Stopping Machine Automatically when Reel is Filled with Wire—By *J. E. Fenno* 380

DIEMAKING, DIE DESIGN, AND PRESS WORK

- Method for Determining Blank Diameters—
By *Joe W. Jensen* 367
Steels Used for Die-Casting Dies 369
How Steel Rule Cutting Dies are Made—
By *Robert F. Salade* 382
Indexing Die for Finishing Small Slots—
By *J. Decker* 386
Corrugating Drawn Shells with Dies Using Steel Balls—By *Warren P. Willett* 388

EDUCATION, TRADE AND ENGINEERING

- Industry's Big Problem—Trade Training 371
Foundrymen Sponsor Apprentice Competition.... 371
American Industries Must Face Problem of Trade Training 378

INSPECTION AND GAGING

- Radium as a Means of Inspection—
By *J. F. Springer* 402

MANAGEMENT PROBLEMS

- It is Time to Recognize that Industry has Done a Good Job 375
How Much Does It Cost to Employ a Man in Industry? 378
Good Judgment Must be Applied to Cost Estimating 378

- Manufacturer's Responsibility for Guarantee Given by Dealer—By *Leo T. Parker* 393
Do Employee Suggestion Systems Produce Results?—By *C. B. Auel* 394
The Purpose and Duty of Industry 398

MATERIALS, METALS, AND ALLOYS

- Aluminum in the Shop Equipment Industries ... 389
Decorative and Protective Coating for Aluminum 393
"Hi-Steel"—A Recent Low Alloy of High Tensile Strength 404
Spoke Type Non-Metallic Gears for General Industrial Use 404
Huge Alloy-Steel Cylinders Help Locomotive Climb Steep Grades 404
Seamless Tubes of Alloy Steel for Use at High Temperatures 404
Chromium-Molybdenum Steel Used in Fabricating the *China Clipper* 405
Phenolic Molding Compounds with Graphite Added 405
Capacity of Buses Increased by Using Nickel Steels 405

SHOP PRACTICE

- A Million and a Half Brass Die-Castings Yearly—
By *Charles O. Herb* 361
A New Rustproofing Method 368
New Methods Introduced in Machining Buick Crankshafts 372
Assembling Hardened Steel Parts that Require Drilling and Riveting—By *Charles Goeman* ... 392
Expansion Bolt for Reamed Hole in Hardened Steel—By *John A. Honegger* 392
Lubricating a Vacuum Pump 393
A British High-Speed Precision Automatic 401
Hard Facing Increases Life of Glass Shear Blades 403
Shop Equipment News 409

WELDING PRACTICE

- Welded Tubular Railing 384
Manipulator for Tilting Heavy Work when Welding 399
Weldability of Materials 399
Oxy-Acetylene Welding and Cutting Progress 400

Your Progress Depends Upon Your Knowledge of Your Industry



Whitney Conveyor Chains offer a solution to your conveyor problems

Manufacturers in many lines of industry have found that Whitney All-Steel Conveyor Chains offer definite advantages on many of their conveyor applications. These chains are particularly designed for conveyor applications within machines where accuracy and finished appearance are essential.

Whitney Conveyor Chains due to the all steel construction offer high breaking strength with light weight and long wearing qualities. They are especially adapted to the use of standard or special attachments.

Whitney engineers can offer valuable suggestions in the design of your conveyor drives.

Write for catalog V-116 A, and further information.

**The Whitney Chain & Mfg. Co.
Hartford, Conn.**

The Whitney Chain & Mfg. Co.
Dept. G-1 Hartford, Conn.

Gentlemen: Kindly send me catalog V-116 A, giving complete information on Whitney All-Steel Conveyor Chains.

Name of Firm

Individual..... Title

Address

WHITNEY CONVEYOR CHAINS

trial Division of the Timken Roller Bearing Co., with headquarters in Canton, Ohio. Mr. Partridge joined the Timken organization in 1925.

S. D. WILLIAMS has been promoted to the position of director of sales of the Timken Steel & Tube Co., Canton, Ohio. Mr. Williams was previously manager of tube sales and has been connected with the organization since 1926.

PARKER APPLIANCE Co., Cleveland, Ohio, announces that the increasing demand for the company's products has necessitated the removal of its plant to larger quarters at 17325 Euclid Ave.

Pennsylvania

NEIL CURRIE, JR., for the last six years manager of the General Electric Co.'s Philadelphia works, has been made manager of the Fort Wayne works, succeeding WALTER S. GOLL, who is retiring as manager, but will be connected with the company on special assignments. R. V. GOOD, previously assistant manager at Philadelphia, was appointed manager to succeed Mr. Currie.

L. D. HOLLAND, formerly sales manager of the western division of E. F. Houghton & Co., 240 W. Somerset St., Philadelphia, Pa., has been made manager of research development, with headquarters at Philadelphia. A. A. MILLER, formerly head of the Cincinnati office, has been promoted to the position of western sales manager, with headquarters in San Francisco, Calif.

NATIONAL ASSOCIATION OF USED MACHINERY AND EQUIPMENT DEALERS held its annual meeting at the William Penn Hotel in Pittsburgh, Pa., on January 18, at which time the officers and directors were re-elected, and J. E. MIDDLETON was appointed secretary. Amendments were adopted providing for individual instead of group membership, and the time for the annual meeting was changed to September.

CLARKE-HARRISON, INC., Packard Bldg., Philadelphia, Pa., has been organized to provide a coordinated consulting service covering problems of general management, engineering, sales, organization and operating methods, budgetary control, accounting practice, production control, and product, plant, and manufacturing studies.

UNITED ENGINEERING & FOUNDRY Co., Pittsburgh, Pa., announces the acquisition of the Wooster, Ohio, plant of the Mackintosh-Hemphill Co., and all drawings and patterns of that company used in the manufacture of rolling mill equipment.

MATHEWS CONVEYER Co., Ellwood City, Pa., has received the official "Award of Merit" issued by the Rice Leaders of the World Association "for high character and worthwhile achievement."

Wisconsin and Illinois

CHARLES R. SURFACE has been made sales manager of the electric motor sales division of the Harnischfeger Corporation, Milwaukee, Wis. Mr. Surface was formerly with the Sprague Electric Works of the General Electric Co., and later was connected with the Westinghouse Electric & Mfg. Co.

DESIGNERS FOR INDUSTRY, INC., announce the opening of a new office at 304 Wrigley Bldg., Chicago, Ill., with CHARLES W. JACK in charge.

LINK-BELT Co., 307 N. Michigan Ave., Chicago, Ill., announces the removal of its St. Louis, Mo., district sales office from 3638 Olive St., to 1018-21 Louderman Building, 317 N. 11th St. HOWARD L. PURDON is district sales manager.

International Amphitheatre, 43rd and Halsted St., Chicago, Ill. Exposition management, 1 N. LaSalle St., Chicago.

APRIL 20-25—Seventh annual OIL EQUIPMENT AND ENGINEERING EXPOSITION, to be held in Convention Hall, Houston, Tex. E. G. Lenzner, general manager, P. O. Box 490, Houston, Tex.

APRIL 21-24—National Production Meeting of the SOCIETY OF AUTOMOTIVE ENGINEERS at the Hotel Cadillac, Detroit, Mich. John A. C. Warner, secretary, 29 W. 39th St., New York City.

MAY 4-7—Convention of the AMERICAN FOUNDRYMEN'S ASSOCIATION at Detroit, Mich. For further information, address the Association, 222 W. Adams St., Chicago, Ill.

MAY 4-9—FOUNDRY AND ALLIED INDUSTRIES EXPOSITION to be held in Convention Hall, Detroit, Mich., in connection with the fortieth annual convention of the American Foundrymen's Association. For further information, address American Foundrymen's Association, 222 W. Adams St., Chicago, Ill.

MAY 31-JUNE 6—Summer meeting of the SOCIETY OF AUTOMOTIVE ENGINEERS at White Sulphur Springs, W. Va. John A. C. Warner, secretary, 29 W. 39th St., New York City.

JUNE 29-JULY 3—Thirty-ninth annual meeting of the AMERICAN SOCIETY FOR TESTING MATERIALS at the Chalfonte-Haddon Hall Hotel, Atlantic City, N. J. R. E. Hess, assistant secretary, 260 S. Broad St., Philadelphia, Pa.

OCTOBER 19-23—NATIONAL METAL CONGRESS, sponsored by the American Society for Metals, the American Welding Society, the Wire Association, the Institute of Metals and the Iron and Steel Divisions of the American Institute of Mining and Metallurgical Engineers, to be held in the Cleveland Public Auditorium, Cleveland, Ohio.

OCTOBER 19-23—Annual METAL EXPOSITION to be held in the Public Auditorium, Cleveland, Ohio, under the auspices of the American Society for Metals. W. H. Eisenman, secretary, American Society for Metals, 7016 Euclid Ave., Cleveland, Ohio, managing director of the exposition.

* * *

Better machinery and methods have raised the mass of the population above the level of primitive agricultural subsistence. This alone has given millions of workers the bath tub, the radio, and the automobile. This alone will continue to provide these newer comforts and to extend them to millions of families now deprived of them. Faith in improved machinery will make it possible to decrease prices without lowering wages, will raise the volume of production, increase employment, and raise the standard of living.—Ralph E. Flanders

COMING EVENTS

MARCH 3-5—Seventh annual GREATER NEW YORK SAFETY CONFERENCE at the Hotel Astor, New York City. For further information, address Greater New York Safety Conference, 9 E. 41st St., New York City.

MARCH 3-6—Sixth PACKAGING EXPOSITION, held under the auspices of the American Management Association at the Hotel Pennsylvania, New York City. Roberts Everett Associates, Inc., 232 Madison Ave., New York City, are the managers of the Exposition.

MARCH 4—Regional meeting of the AMERICAN SOCIETY FOR TESTING MATERIALS at the Hotel William Penn, Pittsburgh, Pa. R. E. Hess, assistant secretary, 260 S. Broad St., Philadelphia, Pa.

MARCH 5-7—INDUSTRIAL EXHIBITION held under the direction of the Purchasing Agents' Association of Western Massachusetts, Inc., in the Municipal Auditorium, Springfield, Mass. For further information, address J. E. Connor, National Equipment Co., Springfield, Mass.

APRIL 6-11—SOUTHERN INDUSTRIAL Show—an exhibition of machinery, power installations, mechanical equipment, accessories and supplies to be held in Textile Hall, Greenville, S. C. William G. Sirrine, president, Greenville.

APRIL 20-21—Twentieth annual convention of the AMERICAN GEAR MANUFACTURERS ASSOCIATION at Hotel Adelphia, Philadelphia, Pa. J. C. McQuiston, manager-secretary, Penn-Lincoln Hotel, Wilkinsburg, Pa.

APRIL 20-24—MIDWEST ENGINEERING AND POWER EXPOSITION, to be held in the

XLO PRECISION BORING MACHINES

Bring NEW ACCURACY and ECONOMY
to Boring, Turning, and
Facing Operations



Made in **5** sizes to
meet every production
requirement. "Junior"
series is illustrated. Send
for complete information.

EX-CELL-O

AIRCRAFT
& TOOL

CORPORATION

DETROIT,
MICHIGAN



COUPON

Please send me descriptive
literature on XLO products
as indicated below:

① ② ③ ④ ⑤ ⑥ ⑦ ⑧

Name _____

Position _____

Company _____

City and State _____

NEW BOOKS AND PUBLICATIONS

ELEMENTS OF DIESEL ENGINEERING. By Orville Adams. 478 pages, 6 by 9 inches. Published by the Norman W. Henley Publishing Co., 2 W. 45th St., New York City. Price, \$4.

The increasing use of Diesel engines in the automotive, marine, stationary, and locomotive fields will make it necessary for many men to be trained in operating these engines during the next few years. The purpose of this book is to assist the engineering student, as well as the practical man, in understanding the working principles and operation of the Diesel engine in a short time. It is written in simple language, without the use of mathematics as far as possible, and illustrated with many charts and sectional and phantom drawings to make the construction clear. Considerable attention is devoted to the development of high-speed automotive Diesels, and extensive information is given on the operation and maintenance of the engine and its auxiliaries. At the end of each chapter is a series of questions and answers which should be of value to teachers of this subject, as well as to those who are using the text for home study.

ELECTRICAL YEAR BOOK 1936. 313 pages, 4 by 6 inches. Published by Emmott & Co., Ltd., 31 King St. W. Manchester 3, England. Price, 1/6, net.

This is the 1936 edition of a little handbook for electrical engineers. The new edition follows the same general arrangement and covers the same scope as previous editions, but the data has been thoroughly revised and some new material has been added. Some explanatory matter on electric rates has been included, as well as information on protective systems for generators, voltage regulation, etc.

HARDENING CHARACTERISTICS AND OTHER PROPERTIES OF COMMERCIAL 1 PER CENT CARBON TOOL STEELS. By T. G. Digges and Louis Jordan. 23 pages,

6 by 9 inches. Published by the United States Department of Commerce, Washington, D. C., as Research Paper RP837 of the National Bureau of Standards. Price, 5 cents.

ECONOMIC PITFALLS IN THE FEDERAL SOCIAL SECURITY ACT. By Allen W. Rucker and N. W. Pickering. An analysis showing how the Federal Security Act will affect some industries far more than others. Published by the Farrel-Birmingham Co., Inc., Ansonia, Conn. Copies obtainable free on request.

TEN FACTS ON TECHNOLOGY AND EMPLOYMENT. 9 pages, 5 1/2 by 8 1/2 inches. Distributed by the Machinery and Allied Products Institute, 221 N. La Salle St., Chicago, Ill.

This little booklet on employment contains statistics showing how machinery has created jobs rather than destroyed employment opportunities.

ELECTRODEPOSITION OF TIN ALLOYS FROM ALKALINE STANNATE BATHS. By R. G. Monk and H. J. T. Ellingham. 9 pages, 6 by 9 inches. Distributed by the International Tin Research and Development Council of London, England. United States representative, L. J. Tavener, 149 Broadway, New York City.

BIBLIOGRAPHY ON FOREMAN IMPROVEMENT. 34 pages, 6 by 9 inches. Published by the United States Department of the Interior, Washington, D. C. Price, 5 cents.

This booklet contains a list of books, pamphlets, and magazine articles on the subject of foreman training.

THE ATMOSPHERIC CORROSION AND TARNISHING OF TIN. By L. Kenworthy. 15 pages, 6 by 9 inches. Distributed by the International Tin Research and Development Council of Lon-

don, England. United States representative, L. J. Tavener, 149 Broadway, New York City.

THE FEDERAL SOCIAL SECURITY ACT AND ITS ADMINISTRATION. By William B. Castenholz. 18 pages, 6 by 8 3/4 inches. Published by the LaSalle Extension University, Michigan Ave. at 41st St., Chicago, Ill.

INDEX TO A.S.T.M. STANDARDS AND TENTATIVE STANDARDS (1936). 160 pages, 6 by 9 inches. Issued by the American Society for Testing Materials, 260 S. Broad St., Philadelphia, Pa.

OBITUARY

ALBERT F. SHORE, president of the Shore Instrument & Mfg. Co., Jamaica, N. Y., died January 17 at the age of fifty-nine years. Mr. Shore was a metallurgical engineer, known throughout the engineering field for his invention of the scleroscope for measuring the hardness of metals. He was awarded the Elliot-Cresson medal by the Franklin Institute. As a member of the American Society for Testing Materials, he contributed many papers on the physical properties of metals and on methods for measuring hardness.

* * *

An ingenious fixture was built for hard-facing valve disks and seats by a valve manufacturer who had an order for 600 valves. As described in *Oxy-Acetylene Tips*, the fixture comprises a low-speed motor, a geared speed reducer from a washing machine, and a dividing head from a milling machine. Any desired speed of rotation from 1/4 revolution per minute can be obtained by this fixture. The job can be tilted to any angle, so that the point at which the operator is working is always level.

This hard-faced punch used for hot-punching jaw slots in wrenches has an average life per grind of 7800 pieces, as compared with an average of 600 pieces for a plain steel punch. The slug shown in the



illustration is of 0.80 per cent carbon steel, and is punched out of 3/4-inch stock. The punch is faced with a cobalt-chromium-tungsten alloy. Photograph, courtesy of Haynes Stellite Co.

The **BEARINGS**, *too, must be designed for*

RUGGED STRENGTH



THE ball bearings used in this Twin City Universal J Tractor were designed and made for tough, abusive service in the hands of the rough-riding farmers who buy M-M Implements in increasing quantities year after year because they "stay on the job".

The illustration shows a sectional view of a 5300 Series BCA Double Row Ball Bearing as supplied to the Minneapolis-Moline

Power Implement Company. It is one of many BCA Bearings used by them throughout their line of tractors and harvesters.

Satisfactory bearing service must begin with proper design. Our engineers, who are experienced in working out bearing applications with others, will be glad to work with you, without obligation, of course.

BEARINGS COMPANY OF AMERICA
513 HARRISBURG AVE., LANCASTER, PA.



A DATA BOOK for Engineers and Draftsmen

A new, complete and more convenient Ball Bearing Data Book

The man at the drafting board will welcome this new and more convenient Ball Bearing Data Book. Complete information on all types with load ratings. New, simplified method of figuring loads at any desired speed. Lies flat on drawing board. Write for copy today.



Classified Contents of this Number

DESIGN, FIXTURE AND TOOL

- Machining Tobin Bronze Pressure Forgings—
By Ben Clark..... 453
- Precision Boring in a Drill Press—By C. F. Staples 454
- The Use of Babbitting Jigs Saves Machining—
By Oliver Herbert..... 470

DESIGN, MACHINE

- Designers Must Design to Please Users Rather
Than Themselves 442
- The Trend is Toward Lower Working Height in
Machine Tools 442
- Reciprocating Motion for Table Obtained by
Means of a Steel Belt—By J. E. Fenno..... 443
- Combined Geneva and Intermittent Gear Move-
ments—By Frederick H. Fairweather..... 444
- Mangle Gear Mechanism for Reciprocating a Ma-
chine Carriage 445
- Simple Flexible Coupling for Small Shafts—
By John A. Honegger..... 458
- Self-Locking Split Pulley—By Frank Muir..... 458
- Simple Formulas for Obtuse-Angled Triangles—
By Fred G. Kenyon..... 465
- Chart for Bevel Gear Calculations—
By Henry R. Bowman..... 467
- Safety Block Clutch for Large Press—
By William C. Betz..... 486

DIEMAKING, DIE DESIGN, AND PRESS WORK

- Rubber and Wood Used for Dies in Forming Air-
plane Parts—By Charles O. Herb..... 425
- Dies for Making Flanged Rectangular Parts from
Strip Stock—By H. Thornton..... 450
- Die for Piercing Fifty-Four Holes in Formed
Sprinkler Top—By R. B. Duffey..... 456
- Hot-Pressing of Non-Ferrous Metals..... 457
- Dies for Forming Wire Links on Four-Slide Auto-
matics 461

DRAFTING-ROOM PRACTICE

- Good Drawings Depend on Good Checking—
By Forrest E. Cardullo..... 433

EDUCATION, TRADE AND ENGINEERING

- The Need for a Revival of Apprentice Training.. 452

LUBRICANTS

- Getting the Best Results from Coolants for Ma-
chining Operations—By O. L. Maag..... 431
- Cutting Lubricant for Brass and Bronze..... 457

MANAGEMENT PROBLEMS

- Replacement of Machine Tools in Navy Yards—
By R. J. Walker..... 438
- Developments Made for Own Use May Find Wide
General Application 442
- Responsibility for Noise and Vibration Caused by
Manufacturing Operations—By Leo T. Parker.. 457

- Estimating Costs of Press Tools—By U. W. Hinman 459
- A Method of Evaluating Qualifications for Promo-
tion 460
- Attention to Small Things May Change Failure to
Success 471
- The American Economic System is Economic
"Voluntarism" 486

MATERIALS, METALS, AND ALLOYS

- "Polaroid," a New "Glass" with Remarkable
Properties 437
- Hard-Facing Increases Life of Shear Blades..... 445
- Metals Used in Die-Casting—
By Charles H. Hughes..... 446
- A Metal Finish Unmarred by Drawing Operations 468
- Extremely Thin Sections in Die-Castings..... 468
- The Navy is the Biggest User of Stainless Steel.. 468
- Nickel Silver Made by the Chinese Long Before
the Christian Era..... 469
- Synthetic Rubber Used in Airplane Fuel Lines.. 469
- Chrome-Molybdenum Steel Obviates a Gear-Grind-
ing Operation 469
- Capacity of Buses Increased by Using Nickel
Steels 469

MEETINGS AND CONVENTIONS

- Tool, Die, and Machine Shop Institute..... 445
- Industrial Shows During 1936..... 449

NEWS OF INDUSTRY

- Engineering News Flashes..... 440
- The Japanese Machinery Industry..... 445
- Soviet Purchases in the United States..... 449
- Is the Ohio "Use Tax" a Protective Tariff Against
Other States 463
- General Electric Establishes 1935 Safety Record.. 466
- News of the Industry..... 488

SHOP PRACTICE

- Threading Two-Ton Oil-Well Pipes on Heavy-Duty
Turret Lathes—By Lorenz Leifer..... 435
- Piston Anodizing Tank with Cooling and Venti-
lating Systems 449
- Force Fit Assembling of Parts on a Shaft—
By C. C. Tomney..... 458
- Machining a New Free-Cutting Aluminum Alloy
in Automatics 464
- Grinding Cobalt Wire to a Diameter of One-Half
Millimeter—By O. S. Marshall..... 466
- Shielding Thin Sections of Punch to Reduce
Hardening Strains—By W. T. Koehler..... 467
- Shop Equipment News..... 475
- Oilstoning Tools to Increase Efficiency—
By Hector J. Chamberland..... 485

WELDING PRACTICE

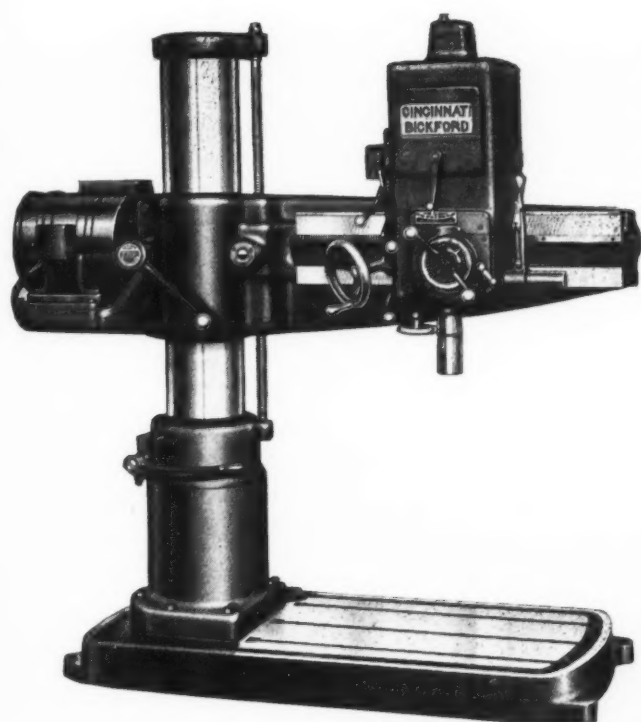
- Savings Due to Using Welded Fixtures..... 466

"More Holes per Dollar"

For Automotive Manufacturers

Cincinnati Bickford Radial and Upright Drilling Machines—literally do give "more holes per dollar" in day in and day out production because of the special features that are a part of their fundamentally correct design. This is being proved in practically every automotive plant in the industry.

Sixty-two years in drilling machine construction provide the experience that "makes" these machines. Send for complete details.



Cincinnati Bickford New High Speed Super Service Radial—9" column, 3' or 4' arm, 9 spindle speeds—4 power feed changes, all changes by sliding gears with single lever control at head. Balanced arm and head move on anti-friction bearings. Option is given of 5 ranges of spindle speed to meet requirements between 75 R.P.M. and 3500 R.P.M.

Cincinnati Bickford New 21", 24" and 28" Super Service Uprights—direct connected driving motor, positive type feed clutch, automatic oiling, ball and roller bearing construction, use of heat treated alloy steel gearing, multiple splined shafts with integral keys, complete enclosure of all working mechanism insure longer life and greater working efficiency. Table arm controls located at front of machine, automatic depth gauge, radial drill type spindle control and feed engagement and other cost reducing features.



THE CINCINNATI BICKFORD TOOL COMPANY
OAKLEY, CINCINNATI, OHIO, U. S. A.

ations. Since entering business in 1913 in the screw machine department of the Potter & Johnston Machine Co., Pawtucket, R. I., Mr. Grindrod has been constantly associated with automatic screw machine operation.

CUTLER-HAMMER, INC., 12th and St. Paul Ave., Milwaukee, Wis., manufacturer of electrical control apparatus, has appointed R. J. ECKSTEIN manager of the company's Cleveland office at 1405 E. 6th St. Mr. Eckstein has been associated with the Cutler-Hammer company for twenty-five years, having worked in practically every department of the business.

DONALD P. HESS, executive assistant to the president of the Timken Roller Bearing Co., Canton, Ohio, has resigned to become vice-president and director of the Ebco Mfg. Co., of Columbus, maker of plumbing fixtures, metal cabinets, and partitions, in which he has recently purchased an interest.

HAROLD VAN DOREN & ASSOCIATES, Toledo, Ohio, has been formed to supersede the firm of VAN DOREN & RIDEOUT, which was recently dissolved. This firm of industrial designers handles designs for a number of well-known companies in the machine appliance field.

Pennsylvania

H. J. FRENCH, of the Development and Research Division of the International Nickel Co., Inc., 67 Wall St., New York City, spoke on the importance of austenite structure in the hardening of steel, with particular reference to the high-carbon steels used ordinarily for tools and dies, and the medium-carbon steels used for gears, before the meeting of the Philadelphia Chapter of the American Society for Metals, February 28, at the Philadelphia Engineers' Club.

LINCOLN ELECTRIC CO., Cleveland, Ohio, has moved its Pittsburgh office from 323 Fourth Ave. to larger quarters at 926 Manchester Blvd., a few minutes' drive from the heart of the city. The new location contains 1000 square feet of floor space for storing and displaying arc welders, electrodes, and supplies. A complete line of Lincoln welders will be on display. F. M. MAICHLE is district manager; W. R. PERSONS and H. E. WHITE, sales engineers.

ILLINOIS TESTING LABORATORIES, INC., 320 N. La Salle St., Chicago, Ill., have appointed RALPH W. BERGEN representative for Maryland, Delaware, southern New Jersey, and eastern Pennsylvania, with offices at 328 Chestnut St., Philadelphia, Pa.

EQUIPMENT ENGINEERING CO., Minneapolis, Minn., announces that the sale of Hi-Lo variable-speed pulleys is now being handled in the western Pennsylvania territory by the CONTINENTAL ENGINEERING SERVICE, New Kensington, Pa.

COMING EVENTS

APRIL 6-11—SOUTHERN INDUSTRIAL SHOW—an exhibition of machinery, power installations, mechanical equipment, accessories and supplies to be held in Textile Hall, Greenville, S. C. William G. Sirrine, president, Greenville.

APRIL 16-17—Meeting of the AMERICAN MANAGEMENT ASSOCIATION at the Hotel Statler, Cleveland, Ohio. Subject: "Problems of the Manufacturing Executive." Alvin E. Dodd, executive vice-president, 330 W. 42nd St., New York City.

APRIL 20-21—Twentieth annual convention of the AMERICAN GEAR MANUFACTURERS ASSOCIATION at Hotel Adelphi, Philadelphia, Pa. J. C. McQuiston, manager-secretary, Penn-Lincoln Hotel, Wilkesburg, Pa.

APRIL 20-24—MIDWEST ENGINEERING AND POWER EXPOSITION, to be held in the International Amphitheatre, 43rd and Halsted St., Chicago, Ill. Exposition management, 1 N. LaSalle St., Chicago.

APRIL 20-25—Seventh annual OIL EQUIPMENT AND ENGINEERING EXPOSITION, to be held in Convention Hall, Houston, Tex. E. G. Lenzner, general manager, P. O. Box 490, Houston, Tex.

APRIL 21-24—National Production Meeting of the SOCIETY OF AUTOMOTIVE ENGINEERS at the Hotel Cadillac, Detroit, Mich. John A. C. Warner, secretary, 29 W. 39th St., New York City.

APRIL 22-23—Thirty-eighth annual convention of the NATIONAL METAL TRADES ASSOCIATION at the Waldorf-Astoria Hotel, New York City. Harry S. Flynn, Peoples Gas Bldg., Chicago, Ill., secretary.

MAY 4-7—Convention of the AMERICAN FOUNDRYMEN'S ASSOCIATION at Detroit, Mich. For further information, address the Association, 222 W. Adams St., Chicago, Ill.

MAY 4-9—FOUNDRY AND ALLIED INDUSTRIES EXPOSITION to be held in Convention Hall, Detroit, Mich., in connection with the fortieth annual convention of the American Foundrymen's Association. For further information, address American Foundrymen's Association, 222 W. Adams St., Chicago, Ill.

MAY 31-JUNE 6—Summer meeting of the SOCIETY OF AUTOMOTIVE ENGINEERS at White Sulphur Springs, W. Va. John A. C. Warner, secretary, 29 W. 39th St., New York City.

JUNE 29-JULY 3—Thirty-ninth annual meeting of the AMERICAN SOCIETY FOR TESTING MATERIALS at the Chalfonte-Haddon Hall Hotel, Atlantic City, N. J. R. E. Hess, assistant secretary, 260 S. Broad St., Philadelphia, Pa.

OCTOBER 19-23—NATIONAL METAL CONGRESS, sponsored by the American Society for Metals, the American Welding Society, the Wire Association, the Institute of Metals and the Iron and Steel Divisions of the American Institute of Mining and Metallurgical Engineers, to be held in the Cleveland Public Auditorium, Cleveland, Ohio.

OCTOBER 19-23—Annual METAL EXPOSITION to be held in the Public Auditorium, Cleveland, Ohio, under the auspices of the American Society for Metals. W. H. Eisenman, secretary, American Society for Metals, 7016 Euclid Ave., Cleveland, Ohio, managing director of the exposition.

* * *

Temperature of Hot Water for Washing Oil from Chips—Correction

In the article "Getting the Best Results from Coolants for Machining Operations," by O. L. Maag, lubrication engineer of the Timken Roller Bearing Co., which was published in March MACHINERY, it was stated in the third paragraph on page 432 that "cutting oil is washed from the chips by means of hot water (118 to 125 degrees F.)." The temperatures should have read "180 to 195 degrees F."

* * *

Joint Engineering Meeting in Chicago

On March 16, a joint meeting of the Chicago Section of the American Society of Mechanical Engineers, the Western Society of Engineers, and the Chicago Chapter of the American Foundrymen's Association was held in the auditorium of the Engineering Building, 205 W. Wacker Drive, Chicago. The subject of the meeting was "Applications of Cast Metals to Engineering Requirements." Garnet P. Phillips of the International Harvester Co., Chicago, Ill., spoke on the "Selection and Application of Cast Metals for Engineering Construction," and George Zabel of the Fairbanks, Morse & Co., Beloit, Wis., spoke on "Engineering in Its Relation to the Foundry."

* * *

Automobile Output Increases

The output of the member companies of the Automobile Manufacturers' Association, which includes practically all manufacturers except Ford, for the first two months of 1936 came close to one-half million cars and trucks, an increase of 17 per cent over the same period last year. This is all the more remarkable, since there was no January show this year to stimulate production.

Standards for the Industry



OK'd

Approved by American Standards Association, February, 1936. The data contained will be used by both the manufacturers and users of Socket Screws.

Holo-Krome have published these "Standards" in book form and of a size (8½ x 11) to fit your present Holo-Krome Catalog. Get your copy or copies now!

HOLO-KROME

BRISTOL, CONN., U.S.A.

**SEND for your
COPY NOW**

*to be used in your
Holo-Krome Catalog*

USE COUPON →

HOLO-KROME SCREW CORP.

BRISTOL, CONN., U.S.A.

Yes, I want ☐ copies of the new "Standards" approved for the Hollow Screw Industry.

I would like ☐ more Holo-Krome Catalogs.

NAME _____

STREET & NUMBER _____

CITY & STATE _____

TITLE _____

115

MACHINERY, April, 1936—97

NEW BOOKS AND PUBLICATIONS

THOMAS' REGISTER OF AMERICAN MANUFACTURERS (1936). 5000 pages, 9 by 12 inches. Published by the Thomas Publishing Co., 461 Eighth Ave., New York City. Price, \$15 (to old subscribers, \$10).

This well-known directory of American manufacturers needs no introduction to the mechanical industry, having proved its usefulness in that field, as well as in many others, through twenty-five years of publication. It covers completely every line of manufacturing in the United States, and is so thoroughly indexed and cross-indexed that the user can readily find the information for which he is looking in the shortest possible time. The various sections are printed on different colored paper to facilitate reference.

In the 1936 edition, the main classified list covers 3823 pages. This is arranged alphabetically by products, the manufacturers being listed according to geographical location. The general arrangement of the book is the same as in previous editions, the first section being an index to the classified section. Following the classified section comes the alphabetical list of manufacturers, which includes the home and branch offices, and in many instances the names of individual officers. This section covers 479 pages. The final section of the book contains a list of trade names and trademarks, arranged alphabetically, and covers 408 pages. The appendix includes lists of representative banks, boards of trade, chambers of commerce, and similar organizations, as well as trade papers.

This book has proved an invaluable aid to purchasing agents, sales managers, executives, superintendents, and all those who make lists of manufacturers for buying, selling, publicity, or other purposes.

AN INTRODUCTION TO THE METALLURGY OF IRON AND STEEL. By H. M. Boylston. 563 pages, 6 by 9 inches. Published by John Wiley & Sons, Inc., 440 Fourth Ave., New York City. Price, \$5.

This is the second edition of a work on the metallurgy of iron and steel intended for students in engineering schools and evening schools, as well as for men working in steel mills. The many new developments in the iron and steel industry during the seven years since the first edition of this book appeared have necessitated a second edition.

The original material has been extensively revised and brought up to date, including statistical tables, and the most important of the new methods and

equipment are described in the present edition. The book describes the fundamentals of iron and steel making in a simple way and gives some attention to the economics of the industry. It contains fifteen chapters covering the following subjects: The Historical and Economic Background of the Iron and Steel Industry; Chemical and Physical Principles; The Raw Materials of the Iron Industry; The Blast Furnace and the Manufacture of Pig Iron; The Foundry; Wrought Iron; Early Steel-Making Processes; The Bessemer Process; The Open-Hearth Process; The Electric Furnace Process; The Manufacture of Commercially Pure Iron; Ingots and Ingot Making; The Mechanical Treatment of Steel; The Composition, Structure, and Physical Properties of Iron and Steel; and Heat-Treatment of Steel.

HOW TO PROTECT BUSINESS IDEAS. By William H. Leahy. 157 pages, 6 by 9 inches. Published by Harper & Bros., 49 E. 33rd St., New York City. Price, \$2.50.

The author of this book on trademarks, patents, copyrights, labels, and kindred properties is general counsel of the Dennison Mfg. Co. and a member of the Bar of Massachusetts and of the District of Columbia. He is, therefore, in a position to give authoritative information on the subject.

A book on law, as it relates to copyrights, trademarks, and kindred subjects, is valuable to the extent that it provides practical information that an engineer or manufacturer may follow. If the work goes further and attempts to make a patent attorney of the engineer, it will defeat its own purpose. The author of the present work, by confining his legal advice to practical and directly usable information, has avoided the pitfalls that have made many of the books on the subject difficult for the layman. The book presents, in one compact volume, the primary and most immediately needed information on its subject. It is divided into seven chapters headed as follows: Idea Protection; Trademarks; Prints and Labels; Patents; Design Patents; Copyrights; and Evidence of Priority.

MACHINERY, EMPLOYMENT, AND PURCHASING POWER. 103 pages, 6 by 9 inches. Published by the National Industrial Conference Board, Inc., 247 Park Ave., New York City. Price, \$2.

This book contains a careful study of the effect of machinery on employment, production, and purchasing power. It discusses the nature, causes, and magnitude of unemployment; the growth of population and gainful employment, in-

crease in volume of production, and shifts in the occupations of the working population; the extent of mechanization, total production, output per worker, creation of new industries, and costs and prices in the manufacturing industries; and increase in purchasing power of total national income, distribution of national income by economic groups, and earnings of wage earners.

The data here presented is convincing evidence of the fact that the mechanization of industry has made possible an increase in the variety of goods and services available to the community, an improvement in their quality, and an expansion in their volume far greater than the growth of population, together with a reduction in working hours without diminishing the total of employment opportunities. The result has been an unparalleled rise in the standard of living in the United States.

AMERICAN LUBRICATING GREASES. By James I. Clower. 80 pages, 6 by 9 inches; 23 illustrations and one chart on classification, composition, and uses of greases. Published by the Virginia Polytechnic Institute, Blacksburg, Va.

This book discusses the manufacture, uses, testing, and application of greases. It also contains chapters on grease versus oil lubrication and grease specifications. The viewpoint of the user has been emphasized, rather than that of the manufacturer. Copies can be obtained free of charge from the Director of Publications, Virginia Polytechnic Institute, Blacksburg, Va.

RESEARCH ON THIN LAYERS OF TIN AND OTHER METALS. By P. J. Haringhuizen and D. A. Was. No. 29, Series A, of Technical Publications of the International Tin Research and Development Council. 7 pages, 6 by 10 inches. Published by the Council, 149 Broadway, New York City.

UNITS OF WEIGHT AND MEASURE—DEFINITIONS AND TABLES OF EQUIVALENTS. Miscellaneous Publication M-121, published by the Bureau of Standards, Department of Commerce, Washington, D. C. 68 pages, 7 by 10 inches. Obtainable from the Superintendent of Documents, Washington, D. C. Price, 15 cents.

TENTATIVE SPECIFICATIONS FOR ELECTRO-DEPOSITED COATINGS OF ZINC, CADMIUM, NICKEL, AND CHROMIUM ON STEEL. 8 pages, 6 by 9 inches. Published by the American Society for Testing Materials, 260 S. Broad St., Philadelphia, Pa. Price, 25 cents.

AN INVESTIGATION OF SOME HAND MOTIONS USED IN FACTORY WORK. By Ralph M. Barnes. 63 pages, 6 by 9 1/4 inches. Published by the University of Iowa, Iowa City, Ia., as Bulletin No. 6. Price, 60 cents.

ADJUSTABLE WHILE RUNNING!

WRENCH-ADJUSTED "OFFSET BORING TOOLS" ARE AS OBSOLETE TODAY AS "HORSELESS CARRIAGES"

They are, in fact, nearly twice as old. One absolutely identical in every mechanical detail with those of today was shown at the Philadelphia Centennial in 1876. Not one essential change has been made in sixty years!

THE PRECISION UNIVERSAL TOOL HEAD

In the Precision Universal Tool Head all adjustments are under absolute micrometric control of the operator at all times and all speeds **WITHOUT STOPPING TOOL OR MACHINE.**

By a mere turn of the wrist, the cutting tool is instantly adjusted to a fraction of a thousandth for boring, or fed continuously across or into the work for facing or recessing.

It is the fastest and most accurate boring tool in existence.

But it is much more than that. It is, as the name implies, a truly universal tool head which faces, counterbores, turns outside diameters of hubs and bosses, recesses, mills flat surfaces and slots, undercuts, backfaces, trepans and does a wide range of "headache" jobs that are utterly impossible with any other tool.

These things the antiquated wrench-adjusted tool cannot do because it cannot be adjusted while running.

One compact size handles every type of internal or external operation on all diameters from 1/16" to 16" and costs less than the two or three sizes of plain wrench-adjusted tools necessary to give the same total capacity.

PERFORMANCE!

Five years ago we sold the first Precision Universal Tool Head. Its buyer has since bought over twenty more. Our largest user now has forty-three Precision Universal Tool Heads in one plant alone and many more in other plants. Scores of concerns have bought from two to fifteen.

It has been adopted by Pratt & Whitney Co. for their latest model Jig Boring Machines, which are now specially arranged to accommodate this tool and to utilize to the utmost its versatility, speed and accuracy.

Let us send you bulletins and additional information regarding this indispensable tool, or arrange for a demonstration in your own plant.



THE PRECISION TOOL COMPANY, Bridgeport, Conn.

Classified Contents of this Number

DESIGN, MACHINE

- Centrifugally Operated Starting and Over-Running Clutch—*By John A. Honegger* 537
- Mechanism for Stacking Articles at the Delivery End of a Conveying Belt—*By F. R. Zimmerman* 538

DIEMAKING, DIE DESIGN, AND PRESS WORK

- Broadening Use of the Coining Process..... 514

GRINDING PRACTICE

- Precision Thread Grinding as a Manufacturing Process—*By Ira J. Snader* 528
- Grinding Universal-Joint Crosses 535

LUBRICANTS AND LUBRICATION

- Lubricating an Air Compressor 542
- Oil for Hydraulic Transmissions 567

MANAGEMENT PROBLEMS

- Automotive Industry Points Way to National Progress—*By William S. Knudsen* 489
- Management and Employee Cooperation in Chrysler Plants—*By K. T. Keller* 503
- A Great Industry that Retains Its Leadership 536
- Overhead Should Not be a Fixed Percentage of Labor Cost 536
- The Use of Machine Equipment Aids Employment 538
- Preparing Shipments for Export 538
- Firm's Liability for Contracts Made by Employees—*By Leo T. Parker* 542
- How Much Does it Cost to Employ a Man in Industry? 566

MATERIALS, METALS, AND ALLOYS

- Acid-Resisting Plastic Material of Light Weight.. 540
- One Hundred Kinds of Steel in Today's Automobiles 540

Treating Ferrous Metals to Resist Corrosion.

- Heat, and Wear 540
- One-Half of all Nickel Produced is Used in U. S. 541

MEETINGS AND EXHIBITS

- Packaging Machinery Involves Ingenious Features 567
- Die-Casting Exhibit in New York 567
- Joint Engineering Meeting in Chicago.....568-A

NEWS OF INDUSTRY

- General Electric Makes Awards to Forty-Three Employees 567

SHOP PRACTICE

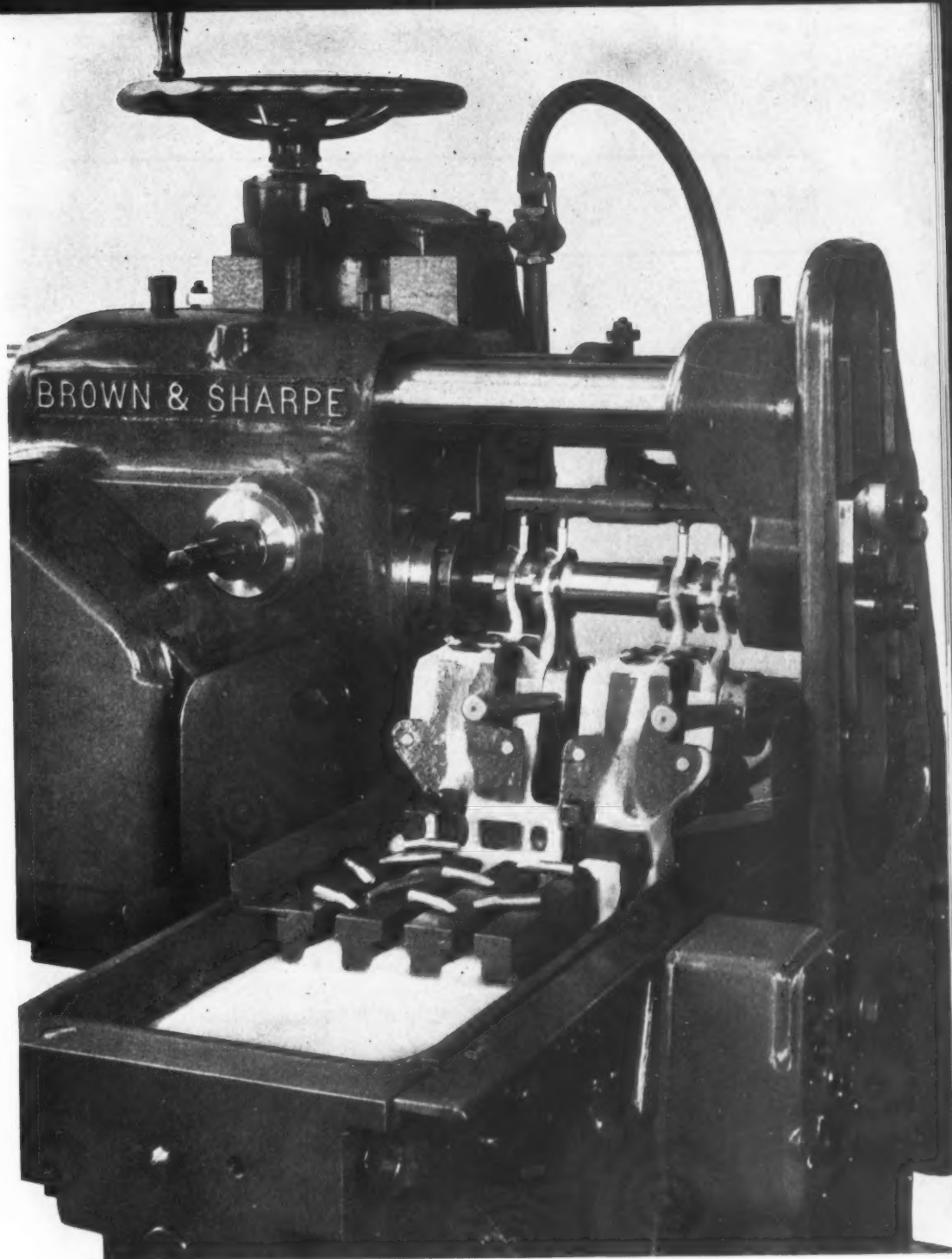
- New Materials and New Methods in Lincoln-Zephyr Manufacture—*By Charles O. Herb* 492
- Broaching Applied to Pressed-Steel Front Axles.. 497
- Ingenious Devices Used in Producing the Packard Transmission 498
- Recent Applications of Cemented Carbide in Automotive Production 500
- High-Frequency Tools Speed up Chevrolet Assembly Line 506
- Special Pneumatic Hammers Make Riveting a One-Man Job 509
- Adapting Present Equipment to Changed Requirements—*By W. D. Averill* 518
- Speeding Automotive Production by Operations on Mult-Au-Matics 522
- Milling Cylinder Blocks by the Rigidmil Automatic Process 524
- Buick's Modernization Program Effects Forge Shop Economies 532
- Plymouth Flywheels—44 an Hour 534
- Shop Equipment News 545

WELDING PRACTICE

- Sparks Fly from 1600 Welders in Building Ford V-Eights 510

Your Progress Depends Upon Your Knowledge of Your Industry

**A NEW
COST
SAVER**



Your work milled on
this modern **Electrically
Controlled** unit may
show surprising savings.
Why not investigate now?

Brown & Sharpe Mfg. Co.
Providence, R. I., U. S. A.

. . . . Particularly Advantageous
for rapid **CLIMB MILLING** with
Formed Cutters in Steel.

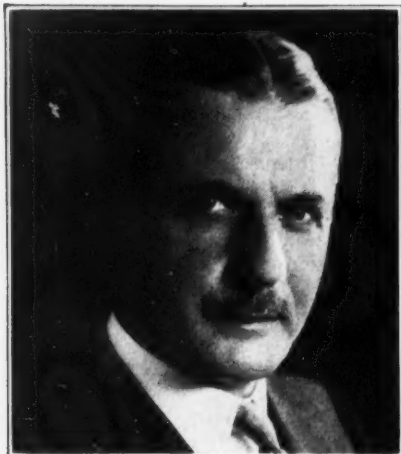
*Automatic Backlash Eliminator on Table Feed Screw
gives New production possibilities . . . eliminates
automatically released during fast table travel*

**The new *Electrically Controlled*
BROWN & SHARPE
No. 12 PLAIN MILLING MACHINE**

NEWS OF THE INDUSTRY

Illinois

ALFRED KAUFFMANN was elected president of the Link-Belt Co., 307 N. Michigan Ave., Chicago, Ill., at the last annual meeting of shareholders, succeeding



Alfred Kauffmann, Recently Elected President of the Link-Belt Co.

GEORGE P. TORRENCE. Mr. Kauffmann started with the company thirty-five years ago as a draftsman. He has held many responsible positions, including designing engineer, superintendent of construction, sales engineer, vice-president and manager of the Link-Belt plant at Philadelphia, vice-president in charge of the Link-Belt Dodge and Ewart plants at Indianapolis, and for the last four years, first vice-president in charge of the company's Chicago plant operations. He was president of the company from 1924 to 1932, and has been a director since 1922.

GEORGE A. NEESHAM, assistant treasurer and purchasing agent of the Wyckoff Drawn Steel Co., Chicago, Ill., has just been elected to the vice-presidency of District No. 3 of the National Association of Purchasing Agents. In addition, he is vice-president of the Illinois Manufacturers' Costs Association, and instructor in purchasing at De Paul University.

NORBERT E. SMITH has joined the sales department of the Inland Steel Co., First National Bank Bldg., Chicago, Ill. He will cover certain territory in the states of Indiana, Ohio, and Kentucky, making Chicago his headquarters. Mr. Smith was with Joseph T. Ryerson & Son, Inc., for fifteen years, being seven years in the sales department at Indianapolis.

CLEARING MACHINE CORPORATION, maker of power presses, has started construction on an addition to its plant at 6499 W. 65th St., Chicago, Ill. The addition will measure 141 feet long by 69 feet wide by 40 feet high. A 50-ton traveling crane will be installed in the new building. The company reports a steady increase in business during the last two years.

JOHN ROLFE has been appointed sales promotion manager of the All-Steel-Equip Co., Aurora, Ill., manufacturer of metal cabinets, lockers, and industrial handling equipment. Mr. Rolfe succeeds JAMES H. GREGORY, who is now associated with the Cramer-Krasselt Co., of Milwaukee.

E. T. BENNINGTON, formerly connected with the Cleveland Tramrail Co., Cleveland, Ohio, has joined the Chicago office of the Harnischfeger Corporation, Milwaukee, Wis., as a sales engineer specializing in cranes and hoists.

R. G. HASKINS Co., 4634 W. Fulton St., Chicago, Ill., has appointed FRED H. LADD, Portland, Ore., distributor for the complete line of Haskins equipment, including flexible-shaft machinery and high-speed tapping equipment.

GEORGE L. ERWIN, JR., formerly general sales manager of the Kearney & Trecker Corporation, Milwaukee, Wis., has been appointed assistant to P. R. Mork, vice-president in charge of sales of the Crane Co., 836 S. Michigan Ave.,



George L. Erwin, Jr., Assistant to Vice-President in Charge of Sales, of the Crane Co.

Chicago, Ill. In his newly created position, Mr. Erwin will develop sales and market research activities.

A. D. HEFFRON, JR. has been appointed Chicago district sales manager of the Babcock & Wilcox Tube Co., Beaver Falls, Pa. Mr. Heffron's headquarters will be at the company's Chicago office, 1502 Marquette Bldg.

NEW DEPARTURE MFG. Co., Bristol, Conn., announces the removal of its Chicago offices from the Peoples Gas Bldg., 122 S. Michigan Ave., to the Carbide and Carbon Bldg., 230 N. Michigan Ave.

Michigan and Indiana

ATHEL F. DENHAM, for many years associated with the Chilton Co., Philadelphia, Pa., has organized Denham & Co., with offices in the Book Building, Detroit, Mich., to engage in laying out and executing complete market development programs for industrial manufacturers. Mr. Denham will have the cooperation of a number of specialists for particular phases of the services, which include market analysis, development of sales plans, industrial and trade advertising, literature and sales helps, consumer research as applied to the industrial and trade fields, and publicity.

WILLIAM J. ALLES, 63 W. Milwaukee at Cass, Detroit, Mich., formerly assistant factory manager at the Dodge plant, Detroit, and prior to that assistant factory manager of Servel Inc., Evansville, Ind., has become Detroit branch manager for the Allsteel Press Co., Inc., 12015 S. Peoria St., Chicago, Ill. Mr. Alles also serves as factory representative for the Tishken Products Co., 4744 Twelfth St., Detroit, and the Mattison Machine Works, Rockford, Ill.

DEVLIEG MILLING MACHINE Co. announces the removal of its office from Jackson, Mich., to 309 Curtis Bldg., Detroit. Arrangements have been made to have the Reed-Prentice Co. of Worcester, Mass., build a full new line of milling machines for the company.

SUNDSTRAND MACHINE TOOL Co., 2530 Eleventh St., Rockford, Ill., has appointed LIVINGSTONE-BURLEIGH, 7310 Woodward Ave., Detroit, Mich., exclusive dealer in the Detroit territory for the joint Sundstrand and American Broach & Machine Co.'s lines.

JAMES M. DEGNAN has been appointed general sales manager of the Hill Diesel Engine Co., Lansing, Mich., succeeding FRED E. MENGEL.

INDESTRUCTIBLE WHEEL Co., Inc., Lebanon, Ind., has been organized to manufacture metal products, wheels, automobile parts, and commercial trailers. The company will also engage in repair

XLO GRINDING SPINDLES
provide the
Highest Degree of Precision
at **PRODUCTION SPEEDS**

XLO Grinding Spindles provide:

1. Long life.
2. Increased production.
3. Improved finish.
4. Greater accuracy.
5. Satisfactory cutting speeds.
6. Longer wheel life.
7. Bearings made for grinding service only.
8. Outboard bearing, equalizing belt load.
9. A style for every make of internal grinder.
10. Both single and double body types.
11. Solid and quill type projections.

Send for your copy of the XLO
Grinding Spindle Catalog.



COUPON

Please send me descriptive
literature on XLO products
as indicated below :

① ② ③ ④ ⑤ ⑥ ⑦ ⑧

Name

Position

Company

City and State

EX-CELL-O

AIRCRAFT
& TOOL

CORPORATION

DETROIT,
MICHIGAN

work and in electric and acetylene welding and cutting, as well as heavy sheet-metal work. The president of the company is A. M. Lofland; vice-president, Harry L. Lenox; and secretary-treasurer, Will C. Davis.

New England

JOHN M. LESELLS, consulting mechanical engineer of Swarthmore, Pa., has been appointed associate professor of mechanical engineering at the Massachusetts Institute of Technology, Cambridge, Mass. He will be occupied with teaching and research in the field of engineering materials.

R. Y. FERNER Co., 161 Devonshire St., Boston, Mass., has been appointed exclusive representative in the United States and Canada by CARL SCHENCK, Darmstadt, Germany, for the material testing equipment, static balancing devices, and dynamic balancing machines built by this firm.

R. A. GRISWOLD, who joined the sales organization of the Bantam Ball Bearing Co., South Bend, Ind., in October, 1935, has been assigned the Connecticut and Massachusetts territory with headquarters at Hartford, Conn.

New York

C. W. DIETRICH, JR., has been recently appointed sales engineer for the Torrington Co., 55 Field St., Torrington, Conn., and the Bantam Ball Bearing Co., South Bend, Ind., to handle their ball bearings, roller bearings, needle bearings, swaging machines, and specialties in the New York territory, with headquarters at 200 Fifth Ave.

MUIR L. FREY has joined the metallurgical staff of the Republic Steel Corporation, Cleveland, Ohio, with headquarters at the Buffalo plant of the company. Mr. Frey was for ten years chief metallurgist of the John Deere Tractor Co., Waterloo, Iowa.

A. B. KINZEL, of the Union Carbide and Carbon Research Laboratories, Inc., 205 E. 42nd St., New York City, recently delivered a lecture in Moscow, U.S.S.R., before the Society for Science and Culture, on the importance of balanced alloys in chromium and manganese steels.

FOOTE BROS. GEAR & MACHINE CORPORATION, 5300 S. Western Ave., Chicago, Ill., has appointed H. S. THAYER, 136 Milnor Ave., Syracuse, N. Y., representative of the company in the central and northeastern part of the state of New York.

INGERSOLL MILLING MACHINE Co., Rockford, Ill., announces that the sale of Ingersoll cutters is now being handled in upper New York State by WILLIAM G. HARVEY Co., 2222 S. Geddes St., Syracuse, N. Y.

JOSEPH F. SWEENEY has become associated with the Federated Metals Corporation, 120 Broadway, New York City, and will specialize in the purchase of scrap nickel, nickel alloys, and nickel bearing material for the company.

Ohio and Pennsylvania

ANGELL NAIL & CHAPLET Co., 4580 E. 71st St., Cleveland, Ohio, has found it necessary to enlarge its plant in order to meet the demand for the company's new developments in nail manufacture. The new plant will also enable the company to draw the wire for its line of manufacture and will provide facilities for making nails automatically from the rod to the finished galvanized nail.

REPUBLIC STEEL CORPORATION, Cleveland, Ohio, has appointed the Equitable Equipment Co., Inc., New Orleans, La., distributor of Enduro stainless steel, and the York Corrugating Co., York, Pa., the Sheet Metal Mfg. Co., Inc., Stamford, Conn., and the NOLAND Co., Inc., Washington, D. C., distributors for Toncan iron sheet.

PHILIP A. SINGLETON and JACK K. WILLIAMS have joined the sales force of the Reliance Electric & Engineering Co., 1042 Ivanhoe Road, Cleveland, Ohio.

E. R. NORRIS, well known throughout the machine tool industry, retired April 1 after forty-four years of continuous service with the Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa. Having acquired a vast experience in manufacturing operations in his early years with the company, he was placed on the staff of the manager of works in 1904. Subsequently, he was appointed assistant works manager and director of works equipment. A recognized authority on factory costs and manufacturing equipment, he was appointed general works manager in 1928, and two years later became assistant to the vice-president.

Wisconsin

A. F. DOBBRODT, of the Chicago office of Carboloy Company, Inc., 2987 E. Jefferson Ave., Detroit, Mich., manufacturer of Carboloy cemented-carbide cutting tools and dies, has been transferred to the Milwaukee office at 2802 Atkinson Ave., and will represent the company throughout the state of Wisconsin.



Walter E. Hawkinson
New Treasurer of the
Allis-Chalmers Mfg. Co.

WALTER E. HAWKINSON has been elected treasurer of the Allis-Chalmers Mfg. Co., Milwaukee, Wis., succeeding the late Raymond Dill, who died recently. Mr. Hawkinson has been with the company for twenty-nine years, advancing through various positions. Since 1926, he has held the post of assistant manager of the tractor division, and prior to that, served for fifteen years in the treasurer's department.

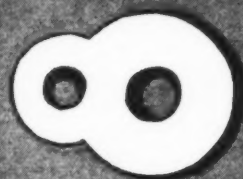
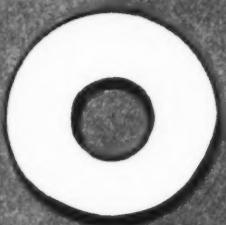
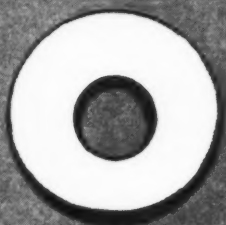
* * *

Michigan Tool Co. Opens New Plant

For the second time in five years, the Michigan Tool Co., Detroit, Mich., has expanded its manufacturing facilities to take care of the increasing volume and the broadening scope of the company's products. The present expansion, in the form of a 20,000 square foot wing adjacent to the main plant, has been completely equipped and tooled for the production and assembly of special machinery. During the last few years, the company has become one of the prominent designers and builders of gear production and checking equipment, as well as special machine tool equipment.

Much of the machine equipment in the new addition is entirely new, including what is believed to be the largest planer in the Detroit area, and a group of large horizontal boring, drilling, and milling machines, standard and universal milling machines, and other machine tools. While most of the larger equipment installed has been bought from other manufacturers, all of the tooling of these machines has been specially designed and made by the company itself and by its subsidiary, the Tungsten Carbide Tool Co.

PER HOUR!



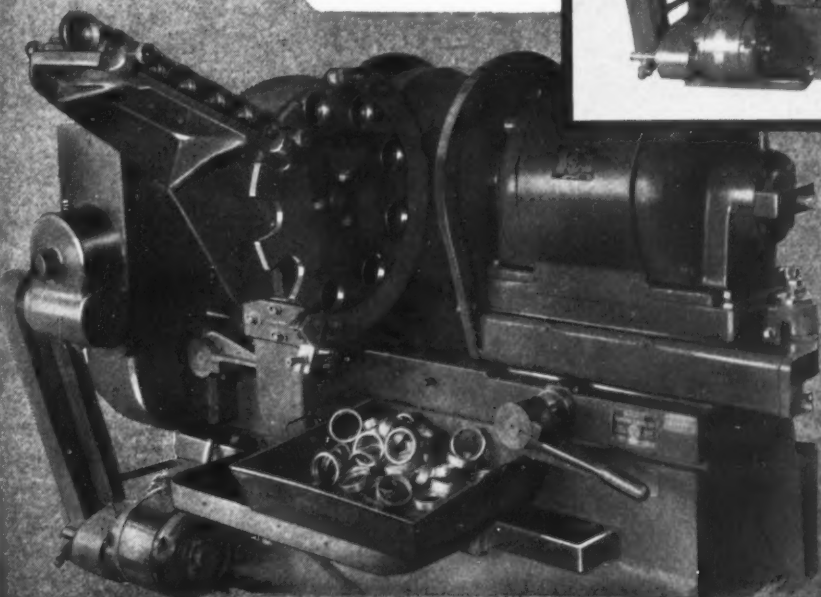
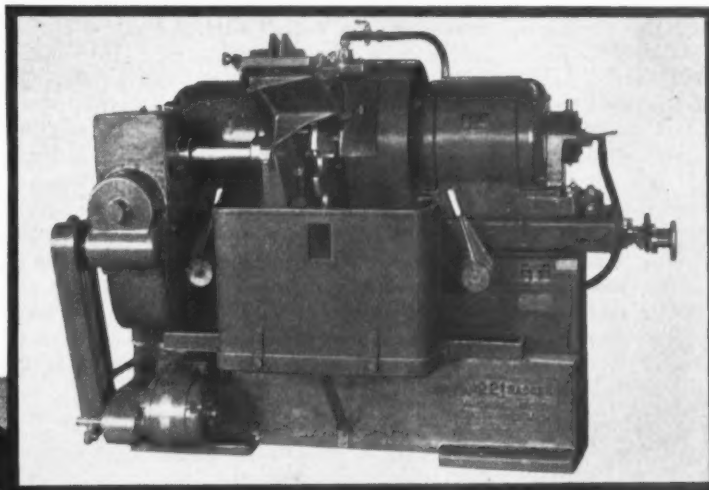
Again Hanchett Grinders demonstrate their unusual capabilities when it comes to production.

Ball bearing rings, about 3" dia. x 3/4" thickness are ground to the difficult .001" tolerance at the rate of 30 pieces per minute. About .005" stock is removed.

It will be seen that different types of carrier loading fixtures can be substituted by removing the 3 cap screws. This method of rotary loading is the most rapid for this kind of work which feeds through two parallel grinding wheels. Unloading is automatic into any suitable container.

Innumerable kinds of work can be accurately machined at extremely high production rates by this No. 121 Hanchett Badger Grinder. We invite requests for information and samples of work for comparative methods and costs.

Hanchett Double Spindle Type Grinder—two 20" dia. nut inserted grinding wheels, each with its own 10 H.P. motor—drive for loading is a 4 speed, 1 H.P. motor with vee-belts and worm reduction gearing.



**HANCHETT
Manufacturing
Company**

Big Rapids, Mich.

COMING EVENTS

MAY 4-7—Convention of the AMERICAN FOUNDRYMEN'S ASSOCIATION at Detroit, Mich. For further information, address the Association, 222 W. Adams St., Chicago, Ill.

MAY 4-9—FOUNDRY AND ALLIED INDUSTRIES EXPOSITION to be held in Convention Hall, Detroit, Mich., in connection with the fortieth annual convention of the American Foundrymen's Association.

MAY 31-JUNE 6—Summer meeting of the SOCIETY OF AUTOMOTIVE ENGINEERS at White Sulphur Springs, W. Va. John A. C. Warner, secretary, 29 W. 39th St., New York City.

JUNE 29-JULY 3—Thirty-ninth annual meeting of the AMERICAN SOCIETY FOR TESTING MATERIALS at the Chalfonte-Haddon Hall Hotel, Atlantic City, N. J. R. E. Hess, assistant secretary, 260 S. Broad St., Philadelphia, Pa.

OCTOBER 19-23—NATIONAL METAL CONGRESS, sponsored by the American Society for Metals, the American Welding Society, the Wire Association, the Institute of Metals and the Iron and Steel Divisions of the American Institute of Mining and Metallurgical Engineers, to be held in the Cleveland Public Auditorium, Cleveland, Ohio.

OCTOBER 19-23—Annual METAL EXPOSITION to be held in the Public Auditorium, Cleveland, Ohio, under the auspices of the American Society for Metals. W. H. Eisenman, secretary, American Society for Metals, 7016 Euclid Ave., Cleveland, Ohio, managing director of the exposition.

NOVEMBER 30-DECEMBER 5—NATIONAL EXPOSITION OF POWER AND MECHANICAL ENGINEERING to be held at the Grand Central Palace, New York City. Charles F. Roth, manager, Grand Central Palace, New York.

Mr. Hyatt, first serving as manufacturing superintendent of the Celluloid Corporation in Newark, N. J., founded by Mr. Hyatt. Later he took over a similar position in another Hyatt enterprise, the Bonsilate Co. of Albany, N. Y., a firm engaged in manufacturing plastics.

In the late eighties, he returned to Newark and worked with Mr. Hyatt on the design of a sugar-cane crushing machine. It was in solving a bearing problem encountered in this machine that the idea of the Hyatt roller bearing was conceived. A few years later, Mr. Hyatt formed the Hyatt Roller Bearing Co., of which Mr. Lockwood became chief engineer. The inventive quality of Mr. Lockwood's mind is shown by the fact that he had taken out nearly one hundred patents in his name. Mr. Lockwood was highly esteemed by his co-workers and will be greatly missed in the Hyatt organization.

OBITUARIES

Charles S. Lockwood

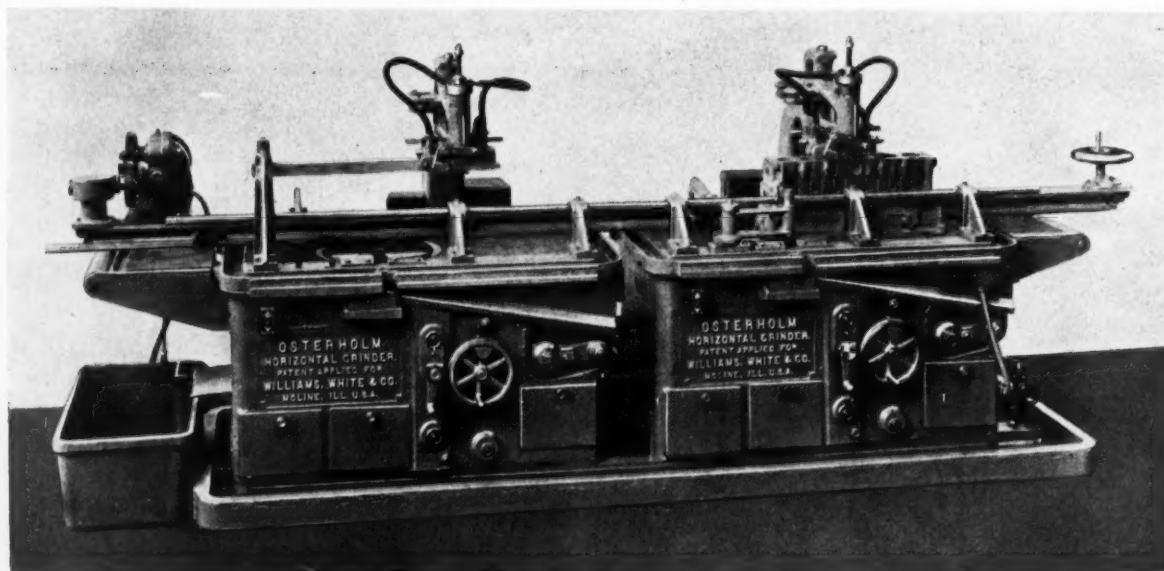
Charles S. Lockwood, collaborator with John Wesley Hyatt in the invention of the Hyatt roller bearing, died in Newark on March 20, in his eighty-sixth year. As an active member of the Hyatt experimental laboratory staff almost up to the time of his death, Mr. Lockwood's career covered sixty-two years of service in the employ of John Wesley Hyatt and the companies founded by Mr. Hyatt. He had been connected with the Hyatt Roller Bearing Co. since its incorporation in 1892.

In 1874, Mr. Lockwood, then a young man in his twenties, joined forces with

Miles W. O'Brien

M. W. O'Brien, president of the South Bend Lathe Works, South Bend, Ind., died of a heart attack at West Palm Beach, Fla., March 20, at the age of sixty-four. Mr. O'Brien was born in Ireland, but came to the United States at an early age. He received his elementary education in New Britain, Conn., and, with his twin brother, John J. O'Brien, worked in several Connecticut plants before entering Purdue University, where both became special students, completing their course in two and a half years. In 1906, they established the South Bend Lathe Works, which, under their management, has become well known in the machinery industry.

Two Osterholm grinding machines arranged in tandem take four successive cuts on the crankcase joint surface of automobile cylinder blocks. A chain carries the blocks progressively across the two ring wheels of these machines. Cuts are taken on each edge of the wheels to grind the surface true within 0.003 inch. The production is from 150 to 175 cylinder blocks an hour. This grinding equipment was built by Williams, White & Co., Moline, Ill.





PROPELLER SHAFTS REQUIRE EXTREME ACCURACY

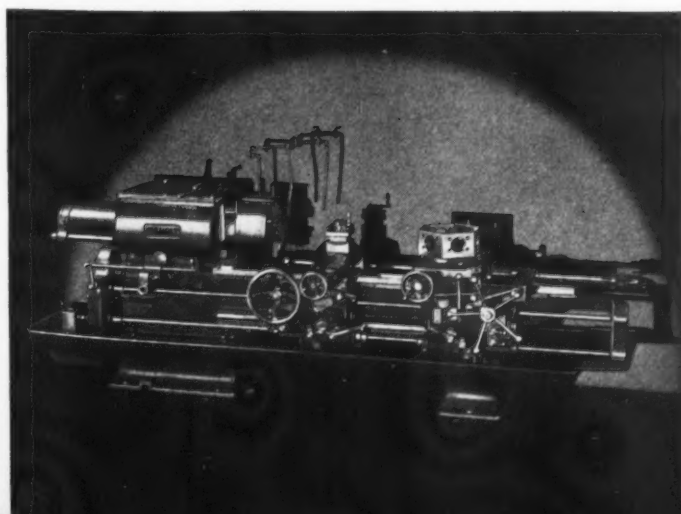


AEROPLANE propeller shafts must be machined to most exacting limits. Perhaps no machinery must be more carefully made.

The Gisholt 2L High Production Turret Lathe is particularly adapted to such work. A special eight-sided turret is required to hold all the tools for completely machining seven different internal diameters and tapers. All operations are performed in one chucking with the outer end of the shaft running in a steady rest. The hardened steel ways, sturdy spindles, precision antifriction bearings, and

rigid bed all contribute to maintaining close tolerances easily. The time is 45 minutes floor-to-floor. Cutting tool life is greatly extended by directing coolant to the very cutting edge.

This application of Gisholt Turret Lathes is an excellent example of doing an extremely accurate job in an efficient way. There is a Gisholt Universal, High Production, or Heavy Duty Turret Lathe to fill every requirement of similar type work. Consult Gisholt Engineers for full details.



GISHOLT MACHINE CO.
1201 EAST WASHINGTON AVE.
MADISON • WISCONSIN

Classified Contents of this Number

DESIGN, FIXTURE AND TOOL

- Boring Tool with Micrometer Adjustment—
By *Phil. E. Veraa* 595
- Fixture with Interchangeable Indexing Bars for
Spacing Rivet Holes—By *Joseph Waitkus* 595
- Fixture for Milling Trunnions in Accurate
Alignment 597
- Simple Cradle for Holding Drill Jig at Different
Angles—By *F. Muir* 599
- Lengthening the Life of Drill Bushings—
By *Edward Heller* 599

DESIGN, MACHINE

- Two-Purpose Intermittent Drive Mechanism—
By *Vincent Waitkus, Jr.* 587
- Over-Running Clutch—By *John A. Honegger* 588
- Modified Geneva Movement of Improved Design—
By *Adolph Moses* 588
- Work-Reversing Mechanism—By *F. H. Mayoh*.... 589

DIEMAKING, DIE DESIGN, AND PRESS WORK

- Now—Cast-Iron Die-Castings!—By *Charles O. Herb* 569
- Forming Die with Collapsible Punch—
By *C. W. Hinman* 598

DRAFTING-ROOM PRACTICE

- Modern Equipment for the Drafting-Room—
By *Walter W. Clarke* 577
- Decimal Dimensions Have Simplified Ford
Manufacture 594

MANAGEMENT PROBLEMS

- Re-Employment Greatest in Highly Mechanized
Industries 586
- Hand-to-Mouth Buying May Become Costly in a
Rising Market 586
- Are Concrete Floors as Objectionable as Alleged? 586
- Liability for Noise and Vibration Produced in
Manufacturing—By *W. F. Schaphorst* 594
- Failure to Fulfill Contracts Because of Strikes—
By *Leo T. Parker* 600

MATERIALS, METALS, AND ALLOYS

- Molding Material of High Strength and Good
Machining Qualities 606

- Steel Sheets and Plates of High Tensile Strength 606
- Comprehensive Exhibit Emphasizes Wide Use of
Die-Castings 606
- Molybdenum Makes Stainless Steel Resist
Corrosive Chemicals 607

MEETINGS AND CONVENTIONS

- National Metal Trades Association Discusses
Employee Relations 605
- Gear Manufacturers Consider Their Industry's
Problems 608

NEWS OF INDUSTRY

- Japanese Machinery Imports Increased in 1935... 579
- Engineering News Flashes 584
- Exports of Industrial Machinery Show Marked
Increase 593
- Employment in Automobile Industry Now Well
Stabilized 598
- General Electric Pension System Real Social
Service 598
- News of the Industry 632-A

SHOP PRACTICE

- Saving Power in Machine Shop with Two-Motor
Drive—By *W. F. Schaphorst* 574
- How to Overcome Some Tapping Troubles—
By *George W. Emrick* 575
- Templets Facilitate Accurate Nibbling of Airplane
Struts 576
- Internal and Surface Broaching of Universal
Joints 580
- Broaching Crankcases at the Packard Plant 593
- Milling Threads on a Gear-Hobbing Machine—
By *O. S. Marshall* 599
- Eliminating Soft Spots from Hardened Tools 600
- Hydraulic Step-by-Step Drilling of Deep Holes ... 601
- Shop Equipment News 611

WELDING PRACTICE

- Building Oil-Well Drilling Equipment by the Use
of Arc Welding—By *C. M. Taylor* 582
- Resistance Welding in Refrigerator Manufacture—
By *M. L. Eckman* 590

Your Progress Depends Upon Your Knowledge of Your Industry

WHERE THERE IS THE
GREATEST OPPORTUNITY

... Reduction of
Non-Productive Time

offers the Greatest Opportunity for savings in milling costs—Rarely one-quarter of the total time on toolroom and short run jobs is productive. The No. 1 Standard Vertical gives lower milling costs through advanced features of design:—first, in reduced set-up time, and, second, by further savings through operating control and convenience.

Also Note:—

New Type of Motorization

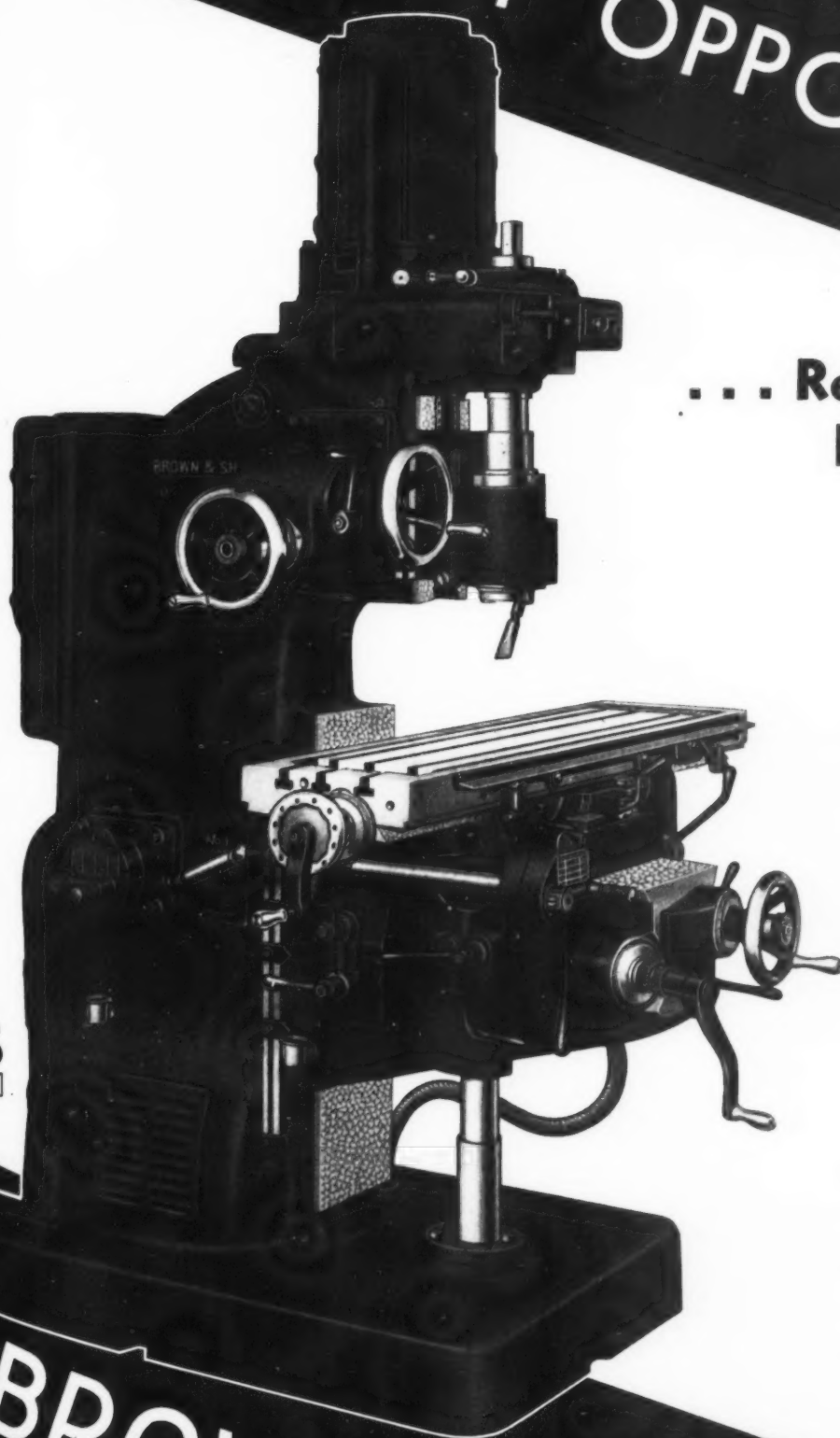
Individual motor drive for spindle and individual motor drive for table and spindle feeds.

Electrical Controls and Wiring Completely Enclosed

Both motors controlled from single push button station accessible from front or rear operating position. May we send details on this modern milling machine?

BROWN & SHARPE MFG. CO.
Providence, R. I., U. S. A.

BROWN & SHARPE
NO. 1 STANDARD
VERTICAL



NEWS OF THE INDUSTRY

California

W. S. CHASE, 106 S. Cordova St., Alhambra, Calif., who for many years was general sales manager of the National Acme Co., Cleveland, Ohio, has been appointed sales manager for the west coast district. Mr. Chase will advise and assist the present agencies of the company in the sale of its products in that territory.

Connecticut

GEORGE E. OLMSTEAD, of New Haven, who has been operating as a manufacturers' agent in Connecticut, has joined the staff of the Morse Chain Co.'s New York office. He will continue to cover the state of Connecticut, making New Haven his headquarters.

Illinois and Indiana

EMIL C. TRANER, of Rockford Ill., has been made president of the Mechanics Universal Joint Division of the Borg-Warner Corporation, 310 S. Michigan Ave., Chicago, Ill., succeeding the late Eric Ekstrom. He will also serve as general manager and treasurer. Mr. Traner has long been identified with the automotive industry, having been general manager of the Rockford Drilling Machine Co., manufacturer of automotive clutches since 1916, a concern that was acquired by the Borg-Warner Corporation in 1929. Since that time Mr. Traner has served as president of that

division. He has been director of the Mechanics Universal Joint Division of the company since 1929.

Link-Belt Co., 307 N. Michigan Ave., Chicago, Ill., has appointed TULIO OSPINA Y CIA., Medellin, Colombia, exclusive representative for the sale of Link-Belt elevating, conveying, and power-transmitting chains and machinery in the districts tributary to the cities of Medellin, Bogota, and Cali in the Republic of Colombia.

INGERSOLL MILLING MACHINE CO., Rockford, Ill., has placed FRANK BURGAN in charge of sales of Ingersoll cutters in Indiana and Ohio. Mr. Burgan was previously assistant manager of the Small Tool Division of the company.

JOSEPH L. BLOCK has been appointed executive vice-president in charge of sales of the Inland Steel Co., First National Bank Bldg., Chicago, Ill. ALBERT C. ROETH has been made vice-president and general manager of sales.

NEW DEPARTURE MFG. CO., Bristol, Conn., manufacturer of ball bearings and the variable-speed "Transitorq," announces that the Chicago sales engineering office of the company has been moved to 230 N. Michigan Ave.

EX-CELL-O AIRCRAFT & TOOL CORPORATION, 1200 Oakman Blvd., Detroit, Mich., has appointed A. D. HEATH, 1701 N. Illinois St., Indianapolis, Ind., exclusive representative for all of the company's products, including those of the Continental and Machinery Divisions, in the southern Indiana territory.

Michigan

JOHN E. LIVINGSTONE CO., 7310 Woodward Ave., Detroit, Mich., has recently been incorporated, succeeding LIVINGSTONE-BURLEIGH, which was recently appointed dealer in the Detroit territory for the Sundstrand Machine Tool Co., of Rockford, Ill. In addition to handling the complete line of Sundstrand milling machines and lathes and the American Broach & Machine Co.'s line of broaching machines and broaches, the company will represent the French Oil Mill Machinery Co., of Piqua, Ohio, manufacturer of semi and automatic molding presses, high-speed coining presses, and special hydraulic machines, together with a complete line of belting and accumulator systems. The John E. Livingstone Co. will also act as direct representative for the Sommer & Adams

Co., Cleveland, Ohio, manufacturer of high-production equipment, particularly continuous-duty operating production machinery.

GREENFIELD TAP & DIE CORPORATION, Greenfield, Mass., manufacturer of screw cutting tools, announces the acquisition of the plant, facilities, and good will of the J. M. CARPENTER TAP AND DIE CO., 2102 W. Fort St., Detroit, Mich. This plant will be operated as a branch of the Greenfield concern. The new plant will be under the management of ALFRED LAPIERRE, who for a number of years has been superintendent of the gage department at the Greenfield plant. JOHN PENNY, who has been in charge of Greenfield sales in the Detroit area, will be district sales manager.

CHARLES T. SCANNELL, general manufacturing manager of the Buick Motor Co., Flint, Mich., was tendered a testimonial dinner on the thirtieth anniversary of his connection with the company. The dinner was attended by the executives of all the manufacturing divisions and the entire factory field executive personnel. Mr. Scannell started as a machinist and toolmaker in the first axle factory of the company thirty years ago, and since that time has steadily advanced to his present position of responsibility, in charge of all Buick manufacturing.

L. E. MUSTARD has been appointed district manager of the Detroit office of the Bristol Co., Waterbury, Conn. Mr. Mustard has been connected with the company since 1923. During the last three years he has been sectional sales and service engineer with headquarters in Dallas, Tex.

CHARLES A. CHAYNE, formerly assistant chief engineer of the Buick Motor Co., Flint, Mich., has been appointed

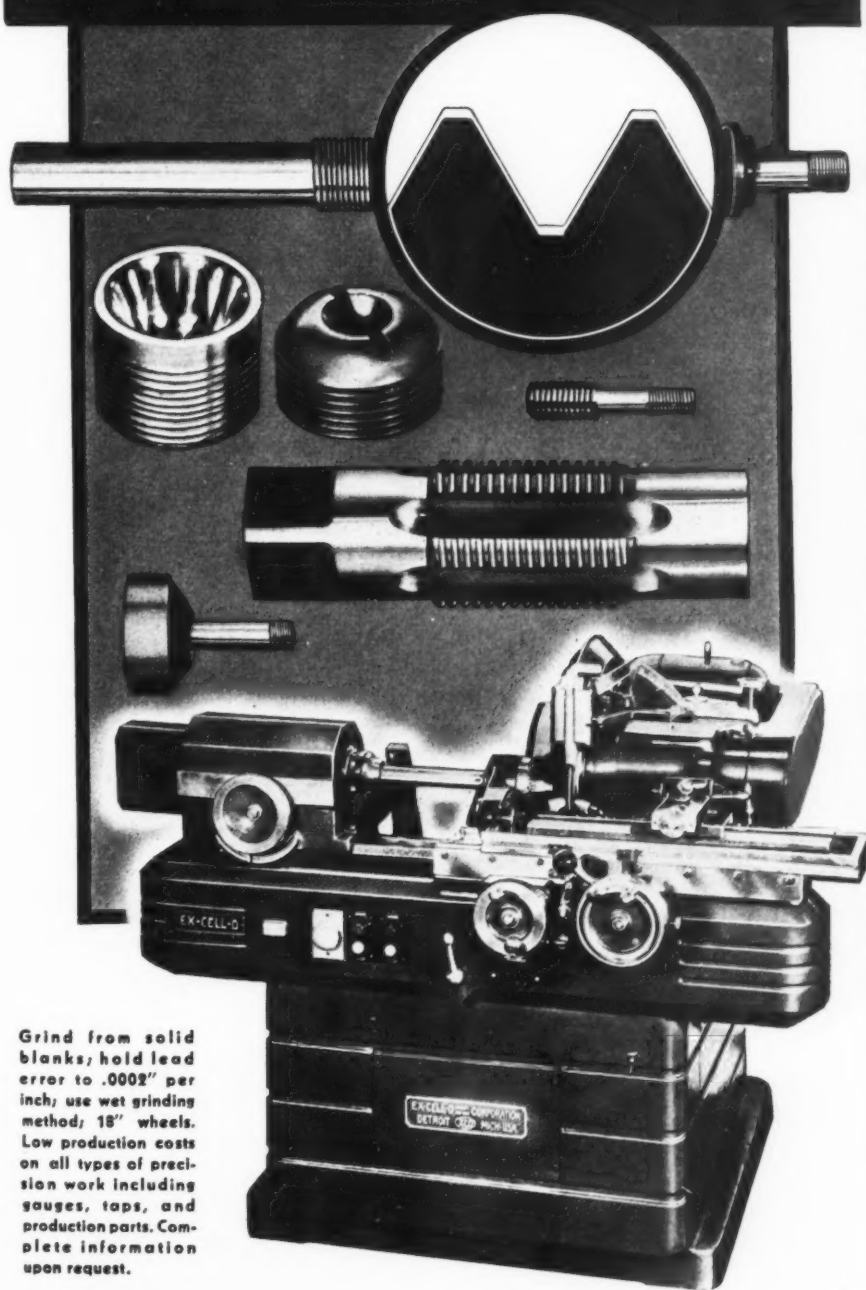


Emil C. Traner, President of Mechanics Universal Joint Division, Borg-Warner Corp.



Charles A. Chayne, Recently Appointed Chief Engineer of the Buick Motor Co.

**XLO
PRECISION THREAD GRINDERS
Produce Accurate Threads
At Low Cost**



Grind from solid blanks; hold lead error to .0002" per inch; use wet grinding method; 18" wheels. Low production costs on all types of precision work including gauges, taps, and production parts. Complete information upon request.

EX-CELL-O

AIRCRAFT
& TOOL

CORPORATION

DETROIT,
MICHIGAN



COUPON

Please send me descriptive literature on XLO products as indicated below:

① ② ③ ④ ⑤ ⑥ ⑦ ⑧

Name _____

Position _____

Company _____

City and State _____

chief engineer. Mr. Chayne succeeds F. A. BOWER, who has been granted an indefinite leave of absence because of ill health.

CARBOLLOY COMPANY, INC., 2985 E. Jefferson Ave., Detroit, Mich., announces that the FRIED. KRUPP WORKS of Essen, Germany, have discontinued importation of Widia cutting-tool material into the United States. For the last eight years, Thomas Prosser & Son, 15 Gold St., New York City, have been the distributors for the United States and Canada of the Widia tool materials. Thomas Prosser & Son, however, will continue their other business the same as in the past, handling grinders for cemented carbides, fine steels, mechanical specialties, chilled iron rolls, hardened steel rolls, and machinery of various kinds, as well as continuing their activities in the United States as representatives of the Krupp Steel Works. In order that the Thomas Prosser & Son's cemented-carbide customers may continue to be served, mutually satisfactory arrangements have been made with the Carboloy Company, for taking over the cemented-carbide tool business of Thomas Prosser & Son, including the inventory of Widia metal, and the greater part of the Prosser sales organization handling the Widia line.

Minnesota

HARRY J. KICHERER has been appointed works manager of the American Hoist & Derrick Co., St. Paul, Minn.



Harry J. Kicherer, Works Manager of the American Hoist & Derrick Co.

Mr. Kicherer was previously connected with the Caterpillar Tractor Co., of Peoria, Ill. He has had twenty years of experience in the manufacture of construction equipment.

New York

TAYLOR-SHANTZ, INC., 485 St. Paul St., Rochester, N. Y., has succeeded the TAYLOR-SHANTZ Co. The new officers are: Shurly C. Hodge, president and treasurer and W. H. Searjeant, vice-president and secretary. The new corporation will continue to manufacture punch press guards, bench tapping machines, stampings and moving picture reels.

ALLEN-BRADLEY Co., 1331 S. First St., Milwaukee, Wis., manufacturer of motor control equipment, announces that, due to increasing business, it has been necessary to move the New York office from 50 Church St. to larger quarters in the Underwood Bldg., 30 Vesey St., New York City.

AMERICAN ENGINEERING Co., 2435 Aramingo Ave., Philadelphia, Pa., manufacturer of hoists, pumps, motors and transmissions, announces the removal of its New York sales office from 40 W. 40th St. to larger quarters in the Evening Post Building, 75 West St., New York City.

UNION TWIST DRILL Co., Athol, Mass., has recently opened a store at 61 Reade St., New York City, where a complete stock of twist drills, taps, dies, milling cutters, and gear-cutters will be carried.

FALK MILL SUPPLY Co., 477 St. Paul St., Rochester, N. Y., machinery and factory equipment merchants, are moving their office, display room, and shop to their new building, at 18 Ward St.

REPUBLIC STEEL CORPORATION, Cleveland, Ohio, has opened a new office in the State Bank Bldg., Albany, N. Y., with J. M. HIGINBOTHAM in charge.

Ohio

LINCOLN ELECTRIC Co., Cleveland, Ohio, announces the following changes in its sales personnel: J. S. McKEIGHAN has been transferred to the sales staff and is located at 1712 Catalpa Drive, Dayton, Ohio. J. B. McCORMICK has been transferred from the Philadelphia office to the Pacific Coast, with headquarters at 3160 Montecito Ave., Fresno, Calif. PAUL W. JAMES has been transferred from the factory at Cleveland to 16 1/2 Crandall St., Binghamton, N. Y. The Major Engineering Works have moved their offices from 210 Jackson Ave. to larger quarters at 312 Second St., Des Moines, Iowa, where a complete stock of Lincoln welders, electrodes, and accessories, as well as Link-Weld motors will be on display.

REPUBLIC STEEL CORPORATION, Cleveland, Ohio, announces the following changes in its personnel: L. L. CASKEY has been appointed district sales manager in the Philadelphia territory, succeeding J. B. DE WOLFE, who has been

transferred to the general offices in Cleveland to assist George E. Totten, manager of sales of the Tin Plate Division. J. W. BRAFFETT, for the last seven years Detroit representative of the Oliver Iron & Steel Corporation, has joined the Detroit sales staff of the company.

SOL EINSTEIN was elected a vice-president of Cincinnati Milling Machine and Cincinnati Grinders, Inc., Cincinnati, Ohio, at a recent meeting of the board of directors. Mr. Einstein started with the company in 1903 as a tracer, becoming next a detailer and designer and rising steadily until he reached the position of chief engineer, which he has held since 1920. He is widely known in engineering circles. At present his work is principally concerned with special engineering and patent matters.

JAMES L. WICK, JR., president and general manager of the Falcon Bronze Co., Youngstown, Ohio, was elected president of the American Foundrymen's Association at the annual business meeting on May 7. HYMAN BORNSTEIN, director of the testing and research laboratories of Deere & Co., Moline, Ill., was elected vice-president.

V & O PRESS Co., Hudson, N. Y., manufacturer of power presses, automatic feeds, and special equipment, announces that the company will be represented in the northern part of Ohio by the Cleveland office of WILLIAM K. STAMETS, Rockefeller Bldg., Cleveland, Ohio.

ALLEGHENY STEEL Co., Pittsburgh, Pa., announces the reopening on May 1 of its downtown Cleveland office, located at 1621 Euclid Ave.

Pennsylvania and Maryland

E. H. JESSOP, formerly with the Morse Chain Co., Ithaca, N. Y., is now associated with the TRANTER MFG. Co., 105 Water St., Pittsburgh, Pa., and will have charge of the sales of Morse chains. A complete stock of Morse industrial products is carried by this company.

CHAIN BELT Co., Milwaukee, Wis., announces the removal of its Pittsburgh office to Room 526, Grant Bldg., Pittsburgh, Pa. G. E. MAHONEY, formerly a sales engineer in the Milwaukee office of the company, has been transferred to the Pittsburgh office.

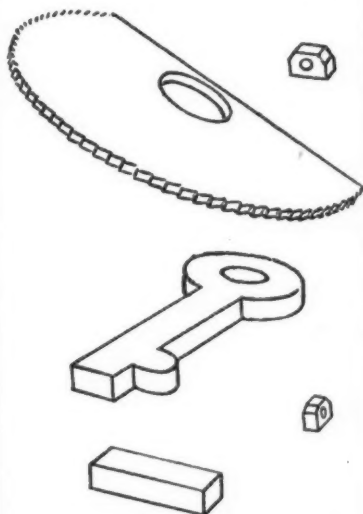
FRANK B. POWERS has been appointed manager of the railway engineering department of the Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa., to fill the vacancy caused by the recent death of Claude Bethel.

JOHN F. COOKE has been placed in charge of sales of the hoist, pump, and marine division of the American Engineering Co., 2435 Aramingo Ave., Philadelphia, Pa.

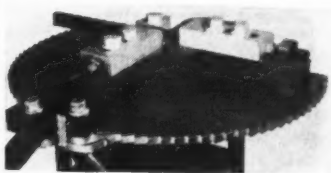


Your machine may seem complicated, but it is simply an assembly of PARTS. One or more of these parts can be made BETTER at LOWER COST by "Shield-Arc" welding.

You can start now. Change one part at a time to "Shield-Arc" welded construction and thus reduce your costs and improve your product. Simply take standard mill shapes and cut them to proper size, like this—



Then assemble and fuse these shapes into a single unit by "Shield-Arc" welding, like this—



The Lincoln man nearby can show you how. He is at your service without obligation.

Photo courtesy of Wallace Supplies Mfg. Co., Chicago, Ill.

ITS COST IS 25% TOO HIGH

The operating mechanism of this bar-bending machine can be made from standard steel plate and bar stock by "Shield-Arc" welding. Of this construction, it would be 35% lighter; it would be more rigid, unbreakable and its cost would be 25% less.

Until this part is changed to "Shield-Arc" welded construction, it is guilty of wasting money every time it is produced!

The odds are five to one that there is a base, frame, gear, lever, cover, container—or at least ONE PART in your product that can be improved or made at lower cost by "Shield-Arc" welding.

The Lincoln man nearby can point out those parts and show you the easiest and most economical way to change them one at a time to "Shield-Arc" welded construction. His services are yours without obligation. THE LINCOLN ELECTRIC COMPANY, Dept. B-265, Cleveland, Ohio. Largest Manufacturers of Arc Welding Equipment in the World.

P. S.—The above part has been changed to "Shield-Arc" welded construction. It is now 35% lighter, more rigid, unbreakable. And users report greatly simplified operation as compared to the old design. An improved product, built for 25% less money!

LINCOLN

"SHIELD-ARC" WELDING

**THE LINCOLN ELECTRIC CO.
Dept. B-265, Cleveland, Ohio**

Show me some Guilty Parts in our product. Show me how to make them stronger, lighter, at less cost by "Shield-Arc" Welding.

Firm
Name
Position
Address
City State

CUTLER-HAMMER, INC., Milwaukee, Wis., manufacturer of electric control apparatus, announces the opening of a new office at 10 W. Chase St., Baltimore, Md. R. A. Haworth will have charge of the Baltimore office.

Tennessee

LINK-BELT Co., 307 N. Michigan Ave., Chicago, Ill., has appointed the INDUSTRIAL SUPPLIES, INC., Poplar Ave. and River Front, Memphis, Tenn., distributor of Link-Belt elevating, conveying, and power-transmitting chains and machinery; Caldwell screw conveyor and fittings; anti-friction bearing units; and complete silent and roller chain drives.

COMING EVENTS

JUNE 15-20—Semi-annual meeting of the AMERICAN SOCIETY OF MECHANICAL ENGINEERS at the Hotel Adolphus, Dallas, Tex. Clarence E. Davies, secretary, 29 W. 39th St., New York City.

JUNE 29-JULY 3—Thirty-ninth annual meeting of the AMERICAN SOCIETY FOR TESTING MATERIALS at the Chalfonte-Haddon Hall Hotel, Atlantic City, N. J. R. E. Hess, assistant secretary, 260 S. Broad St., Philadelphia, Pa.

OCTOBER 19-23—NATIONAL METAL CONGRESS, sponsored by the American Society for Metals, the American Welding Society, the Wire Association, the Institute of Metals and the Iron and Steel Divisions of the American Institute of

Mining and Metallurgical Engineers, to be held in the Cleveland Public Auditorium, Cleveland, Ohio.

OCTOBER 19-23—Annual METAL EXPOSITION to be held in the Public Auditorium, Cleveland, Ohio, under the auspices of the American Society for Metals. W. H. Eisenman, secretary, American Society for Metals, 7016 Euclid Ave., Cleveland, Ohio, managing director of the exposition.

NOVEMBER 30-DECEMBER 5—NATIONAL EXPOSITION OF POWER AND MECHANICAL ENGINEERING to be held at the Grand Central Palace, New York City. Charles F. Roth, manager, Grand Central Palace, New York.

* * *

Simplified Practice for Full-Disk Buffing Wheels

The Division of Simplified Practice of the National Bureau of Standards has announced that the Simplified Practice Recommendation R115-30, for full-disk buffing wheels has been reaffirmed without change by the standing committee of the industry. This recommendation establishes a series of eleven standard outside diameters for 20-ply full-disk buffing wheels. It has been in effect since January, 1930, and will now be continued without change. Copies of the recommendation may be obtained from the Superintendent of Documents, Government Printing Office, Washington, D. C., at 5 cents each.

* * *

According to Alfred Reeves, vice-president and general manager of the Automobile Manufacturers Association, more than half of the mileage of passenger automobiles today is used for business and commercial purposes.

OBITUARIES

George H. Feltes

George H. Feltes, president and treasurer of the Standard Electrical Tool Co., Cincinnati, Ohio, died suddenly of acute indigestion on May 6 at French Lick Springs, Ind. Mr. Feltes was born in Glendale, Ohio, in 1879. He was a pioneer in the electrical tool industry, having entered the field in 1903, when he organized the U. S. Electrical Tool Co. He was secretary, treasurer, and sales manager of this company from 1903 to 1925, at which time he retired from business. In about a year's time, however, he re-entered business after acquiring control of the Standard Electrical Tool Co., of which he was president and treasurer at the time of his death.

CLAUDE BETHEL, manager of the railway engineering department of the Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa., and a contributor to many important developments in the electric transportation industry, died recently of pneumonia, after a week's illness. He had been connected with the Westinghouse organization since 1919.

BURTON L. DELACK, general assistant to Vice-president W. R. Burrows of the General Electric Co., Schenectady, N. Y., and until two years ago manager of the company's Schenectady Works, died on May 7, following a stroke suffered at his office the previous afternoon.

WILLIAM G. MERWARTH, shop superintendent of the Pennsylvania Pump & Compressor Co., Easton, Pa., died on April 24 at the age of sixty-five.



An Evidence of the Success of an Apprentice System. In 1918 Jimmie Munro, a graduate of the Caterpillar Tractor Co.'s apprentice school, received his certificate of graduation. The accompanying photograph shows "Jimmie," now factory manager James R. Munro of the company's tractor division, attaching his signature for the first time to an apprentice graduation certificate, that of Alvie C. Rice, who has just graduated after a four years' apprenticeship with the Caterpillar Company. Of the more than 100 graduates of the Caterpillar apprentice school, only two have left the company's employ. The apprentice classes today number 310 young men.

SEVEN for the Price of ONE

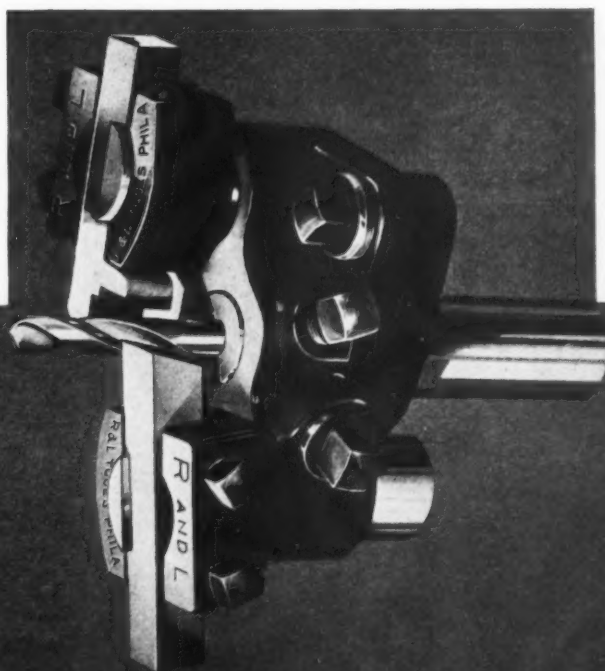
ROLLER BOX TOOL	\$43.00
CENTERING AND FACING TOOL	9.75
KNEE TOOL	24.00
POINTING TOOL	20.00
BACK REST	14.00
FLOATING DRILL HOLDER	7.00
BALANCED TURNING TOOL	24.00
	141.75
SAME FOR LEFT HAND	141.75
	\$283.50

\$65.

RIGHT
R AND **L**
LEFT

The large illustration at the right shows the R and L Turning Tool set for Drilling and Turning at one operation. Note the ample room for chip clearance. The illustration immediately below shows the Tool set as a Balanced Turning Tool with one cutter set in advance of the other, turning two diameters.

The R and L Turning Tool is a new and improved development, producing better work at less cost—actually saving over \$200 on the initial cost alone! Investigate the additional money-saving possibilities . . . write for descriptive folder.



Seven Tools in One—the R and L Turning Tool does the work of all the tools listed at the left . . . and does it BETTER! It SAVES MONEY! It SAVES TIME! It BOOSTS PRODUCTION! As the name implies, the R and L Tool can be changed from Right to Left—or Left to Right—in 10 seconds! No other tool has this patented feature.

One secret of the success of the R and L Turning Tool is the use of Tantalum Carbide in the Backrest. Due to the extreme hardness of Tantalum Carbide, a highly polished surface—true to size and straight—is produced without effort.

R AND L TOOLS
Nicetown, Philadelphia, Pa.

Several desirable territories are available for wide-awake distributors. We invite your inquiries.

Tantalum Carbide Faces on the R and L Backrest act as a burnisher, making it impossible to pick up metal and mar the surface of the work with scratches or blisters. This replaces Rollers and Roller Shafts, avoiding misalignment due to Roller wear, and works especially well on stainless steel and other tough alloys.



Classified Contents of this Number

DESIGN, FIXTURE AND TOOL

- Increasing Production by Simple Changes in Jigs and Tools—*By Vernon E. Davis* 659
- Indexing Jig with Revolving Work-Retainer—*By F. Server* 661
- Milling Fixture with Quick-Acting Equalizing Clamp—*By C. E. Geoman* 662
- Fixture for Slotting Screw-Heads—*By Phil. E. Veraa* 665

DESIGN, MACHINE

- Designing Cams for Automatic Screw Machines—*By I. A. Swidlo* 641
- Stock-Feeding Mechanism with Four-Direction Movement—*By F. H. Mayoh* 645
- Double-Action Cam that Moves Transfer Arm in Three Planes—*By Joseph E. Fenno* 646
- Gear Noise—Its Causes and Correction 669

DIEMAKING, DIE DESIGN, AND PRESS WORK

- The Dies Used in Brass Die-Casting—*By Charles O. Herb* 638
- Making Automobile License Plates 657
- Twisting and Straightening Die—*By Louis H. LePold* 660
- Shear-Proof Blanking Die—*By William Stener*... 662

DRAFTING-ROOM PRACTICE

- Dimensioning Dovetail Slides—*By J. Homewood*. 664

MANAGEMENT PROBLEMS

- "Fewer Working Hours and Less Machinery" Solves no Problem 652
- Repairing Patented Machines—*By Howard S. Bryant* 653
- Discharged Employee's Right to Bonus Payments—*By Leo T. Parker* 663
- Steel Casting Rush Orders Should be Discouraged—*By Raymond L. Collier* 671
- Does Industry Again Face Regimentation? 695

MATERIALS, METALS, AND ALLOYS

- The Search for Better Quality in Tool Steels—*By C. A. Liedholm* 666

- Metal-Protecting Finish for Machinery 671
- New Steel Combines High-Temperature Strength and Oxidation Resistance 674
- Metal Coatings Now Obtainable on Cardboard.... 675
- Nickel Steel Improves Efficiency of Mine Skips.. 675
- Sand-Blasting Machine Protected by Rubber.... 675

MEETINGS AND EXHIBITS

- National Metal Exposition in Cleveland 637
- Exhibitions in 1936 658
- Franklin Institute Ball-Bearing Exhibit 670
- Machine Tool Builders Deal with Economic Problems 671

NEWS OF INDUSTRY

- Engineering News Flashes 650
- Machine Tool Builders' Association Receives Outstanding Award 668
- Peter Hall of the Hall Planetary Co. Honored.... 671

SHOP PRACTICE

- Extensive Use of Gage-Blocks Insures Ford Accuracy—*By Charles O. Herb* 633
- Conveyor Line with Coil "Up-Ending" Device.... 644
- Automobile Painting is the Last Word in Metal Finishing 648
- Machining Brake-Drums 664
- Preventing Soldering Irons from Overheating—*By Thomas Trail* 665
- Lubricating High-Temperature Bearings—*By W. F. Schaphorst* 665
- Carbide-Tool Grinding has been Speeded up..... 673
- Shop Equipment News 679
- Grinding Thrust Bearing Plates for Derricks.... 696

WELDING PRACTICE

- Accurate Timing Has Greatly Increased the Scope of Spot-Welding—*By Dr. Paul G. Weiller*..... 655
- What is Percussion Welding? 663
- Welding Research Extended 667
- An Anniversary in the Welding Field 673

Your Progress Depends Upon Your Knowledge of Your Industry



Handiness
•
Accuracy

Power
•
Speed

... all coordinated in a **Modern** design, make the Brown & Sharpe **HIGH SPEED** machines unusually productive on present day demands of manufacturing or toolroom work.

Five Sizes—2A and 3A Universal, 2B and 3B Plain and 2 Vertical Spindle. May we send details?

Brown & Sharpe Mfg. Co.
Providence, R. I.
U.S.A.

BROWN & SHARPE
HIGH SPEED
MILLING MACHINES



NEWS OF THE INDUSTRY

New York and New Jersey

CUMBERLAND STEEL CO., Cumberland, Md., manufacturer of turned and ground steel shafts, announces the appointment of A. C. Cook as district sales manager in the territory covering New York City, Long Island, northern New Jersey, and eastern New York State. His headquarters will be at 30 Church St., New York City. Mr. Cook was connected with the Warner & Swasey Co., Cleveland, Ohio, for over twenty years in the capacities of district sales manager of the New York City territory, general sales manager, and vice-president.

CHARLES P. KNUFFER has been appointed general manager of the Carborundum Co., Niagara Falls, N. Y. Mr. Knupper represented the company for

Indiana

KARL HERRMANN, vice-president and general manager of the Bantam Ball Bearing Co., South Bend, Ind., has retired and has been succeeded by A. H. FRAUENTHAL, formerly assistant general manager. Mr. Frauenthal became connected with the Bantam organization in 1930. Previous to that, he had served as quality engineer with the Studebaker Corporation, and before that, was chief inspector and metallurgical engineer



A. H. Frauenthal, New Vice-president and General Manager, Bantam Ball Bearing Co.

with the Chandler Corporation. After being divisional manager in charge of sales, engineering, and manufacturing of the Bantam Ball Bearing Co., for several years, he was appointed assistant general manager of the company. Although Mr. Herrmann has retired from his major duties as general manager, he will continue to serve the company as consulting engineer. He has been associated with the Bantam Company since 1929, and previous to that was connected for twenty years with the Studebaker Corporation. After a vacation, he plans to re-enter the automotive field.

BANTAM BALL BEARING CO., South Bend, Ind., manufacturer of roller and ball bearings, is building an addition to its plant at a cost of \$250,000. This new expansion gives an additional area slightly greater than the addition built last year, which gave the factory a 60 per cent increase in floor space. The enlarged facilities are required by the rapid growth in business, which has increased over eight times since 1932.

Massachusetts

H. C. MANN, senior materials engineer, Ordnance Department, Watertown Arsenal, has been awarded the Charles B. Dudley medal for 1936 by the American Society for Testing Materials. This medal, which commemorates the name of the first president of the Society, is awarded to the author of the most outstanding paper presented at the preceding annual meeting.

Michigan

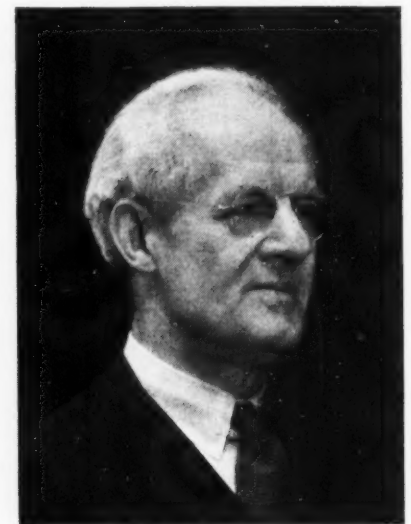
MICROMATIC HONE CORPORATION, Detroit, Mich., manufacturer of cylindrical honing tools, has just completed an addition to its plant at Dubois St. and Horton Ave., which doubles the manufacturing floor space. It is also announced that HERBERT J. WOODALL, well known in Detroit industrial circles, has recently been elected to the board of directors.

ALL-STEEL-EQUIP CO., Aurora, Ill., manufacturer of steel cabinets, lockers, files, and other office and shop equipment, has appointed H. L. BREITENSTEIN district manager in Detroit. Mr. Breitenstein has been connected with the company for the last twelve years. His headquarters will be at 311 Donovan Bldg., Detroit.

LINDBERG ENGINEERING CO., 221 Union Park Court, Chicago, Ill., announces the opening of a Detroit office at 7338 Woodward Ave.



Karl Herrmann, Retiring Vice-President and General Manager, Bantam Ball Bearing Co.



Charles P. Knupper, General Manager of the Carborundum Company

many years as continental sales manager in Europe. He will make his headquarters at Niagara Falls.

CHICAGO PNEUMATIC TOOL CO., 6 E. 44th St., New York City, has opened a new sales and service branch at 2415 Commerce St., Dallas, Texas. D. G. Reeder is district manager. The Pittsburgh office has been moved to 810 Chamber of Commerce Bldg.

MIDWEST TECHNICAL GUILD, 129 W. 22nd St., New York City, announces a course in mechanical drafting as applied to machine shop practice. The course is laid out to meet the requirements of tool and die makers and industrial salesmen. J. K. WOHLFELD is manager.

BAKELITE CORPORATION, 247 Park Ave., New York City, has just completed an addition to its plant at Bound Brook, N. J. This building, containing 12,000 square feet of floor space, will be devoted entirely to the volume production of "Bakelite Resibond."

The
ARISTOCRAT
of Bearings



The Hoover Customer List is a Register
of America's Finest Industrial Firms

HOOVER

BALL *and* BEARING CO.

A N N A R B O R • • • M I C H I G A N

Ohio

E. P. BURRELL, director of engineering for the Warner & Swasey Co., Cleveland, Ohio, has been awarded the honorary degree of Doctor of Engineering by the Case School of Applied Science, Cleveland. Dr. Burrell is known throughout the scientific world for his work in the designing and building of telescopes and observatories and for his development

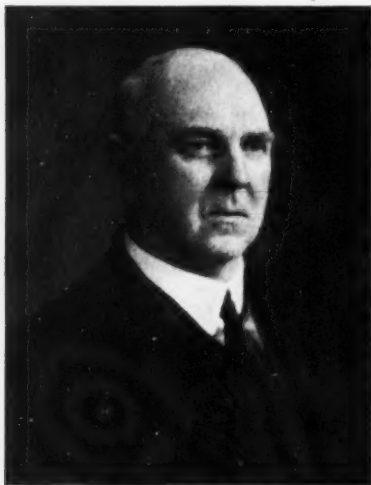


Photo by Standiford

E. P. Burrell, who has been Awarded the Degree of Doctor of Engineering by the Case School of Applied Science

work in connection with turret lathes. The 82-inch McDonald reflecting telescope, now being erected in western Texas for the University of Texas, is his latest achievement in this field. He has been associated with the Warner & Swasey Co. for the major part of his business life.

MASTER TOOL CO., INC., 5605 Herman Ave., N.W., Cleveland, Ohio, Division of Eastern Cutter Salvage Corporation, 30-32 Littleton Ave., Newark, N. J., has purchased the Cleveland plant of the HALE CHROME SERVICE Co., and will operate the business as the MASTER CHROME SERVICE, INC., 5609 Herman Ave., N.W., Cleveland, specializing in the depositing of hard chromium on dies, tools, gages, and other parts where wear is an important factor. This organization has facilities for depositing chromium in thicknesses of from 0.001 inch to 1/8 inch on parts as small as a needle and as large as guide bars and piston bars for locomotives.

LATROBE TOOL MFG. CO., Latrobe, Pa. (Division of Whitman & Barnes, Inc.), manufacturer of twist drills and reamers, announces the acquisition of the BUCKEYE TWIST DRILL CO., Alliance, Ohio. The Buckeye plant will continue to be operated at Alliance as a separate unit under the direction of A. A. MULAC, general manager, who has been presi-

dent of the Buckeye Twist Drill Co. for the last twenty years. J. G. ECK will continue in charge of sales at the Alliance office, under the direction of HARRY J. COGSWELL, president of the Latrobe Tool Mfg. Co., whose headquarters are located in Chicago.

JULIUS KAHN, who has been president of the Truscon Steel Corporation since the founding of the company thirty-three years ago, has resigned to become vice-president in charge of product development of the Republic Steel Corporation, Cleveland, Ohio. FORREST H. RAMAGE has been promoted from the position of assistant manager of the advertising and sales promotion division to sales promotion manager. STANLEY A. KNISELY, formerly manager of the advertising and sales promotion division has been made director of advertising. CHESTER W. RUTH has been made assistant director of advertising.

FOSTORIA PRESSED STEEL CORPORATION, Fostoria, Ohio, announces the addition of a new heavy-duty unit to its line of coolant filters, the new unit being known as the No. 12 model. This unit has a capacity twice that of the No. 3 unit, and has a filtering bowl approximately 13 inches in diameter.

E. J. LEES has been appointed chief engineer in charge of engineering and research of the National Tool Co., Cleveland, Ohio. Mr. Lees, formerly with the Lees-Bradner Co., is a well-known engineer in the machinery and tool industry. He has been a pioneer in the design of many types of equipment, including heavy milling machines, gear-hobbing machines and hobs, thread milling machines, gear grinding machines, gear testing machines, and automatic twist drill making machines, and is responsible for many other improvements in machinery and tools.



Photo, Edmondson Studio

E. J. Lees, Chief Engineer in Charge of Engineering and Research, National Tool Co.

F. P. SHEPHARD has been appointed district sales manager of the Cleveland office of the Haynes Stellite Co., 205 E. 42nd St., New York City, to succeed the late W. A. Moore. Mr. Shephard has been sales engineer in the Chicago office of the company for the last nine years.

GEORGE M. SNODGRASS has recently been appointed general sales manager of the Imperial Electric Co., Akron, Ohio, manufacturer of electric motors and generators. For the last fifteen years, Mr. Snodgrass has been connected with Fairbanks, Morse & Co., Chicago, Ill.

UNION DRAWN STEEL CO., Massillon, Ohio, has moved its Dayton office to larger quarters at 621 Mutual Home Bldg. Ralph Hering, who has served in the Dayton territory for the last four years, will be in charge of the new office.

BRIDGEPORT SAFETY EMERY WHEEL CO., Bridgeport, Conn., has appointed FRED D. BAKER, 17545 Madison Ave., Lakewood, Ohio, district representative for the central and northwestern sections of the state of Ohio.

C. E. SIMS, formerly assistant director of research for the American Steel Foundries, Indiana Harbor, Ind., has been appointed research metallurgist at the Battelle Memorial Institute, Columbus, Ohio.

REPUBLIC STEEL CORPORATION, Cleveland, Ohio, has appointed the JENSEN-BYRD Co., Spokane, Wash., distributor of Enduro stainless steel.

Pennsylvania

MORRIS E. LEEDS, president of the Leeds & Northrup Co., Philadelphia, Pa., has been awarded the Henry Laurence Gantt gold medal for distinguished achievement in industrial management. The award was made by Henry S. Dennison, president of the Dennison Mfg. Co., of Framingham, Mass., at a dinner held on June 4 at the Hotel Astor in New York City.

C. R. COX, formerly general superintendent of the Ellwood Works of the National Tube Co., Pittsburgh, Pa., was elected vice-president in charge of engineering and operations, succeeding P. C. PATTERSON. Mr. Cox's headquarters will be in Pittsburgh.

EDWARD J. HANLEY, formerly assistant superintendent of the wire and cable department of the Schenectady Works of the General Electric Co., has been appointed secretary of the Allegheny Steel Co., Brackenridge, Pa.

M. W. SMITH has been appointed manager of engineering of the Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa. Mr. Smith has been associated with the company since 1915.

FLASH

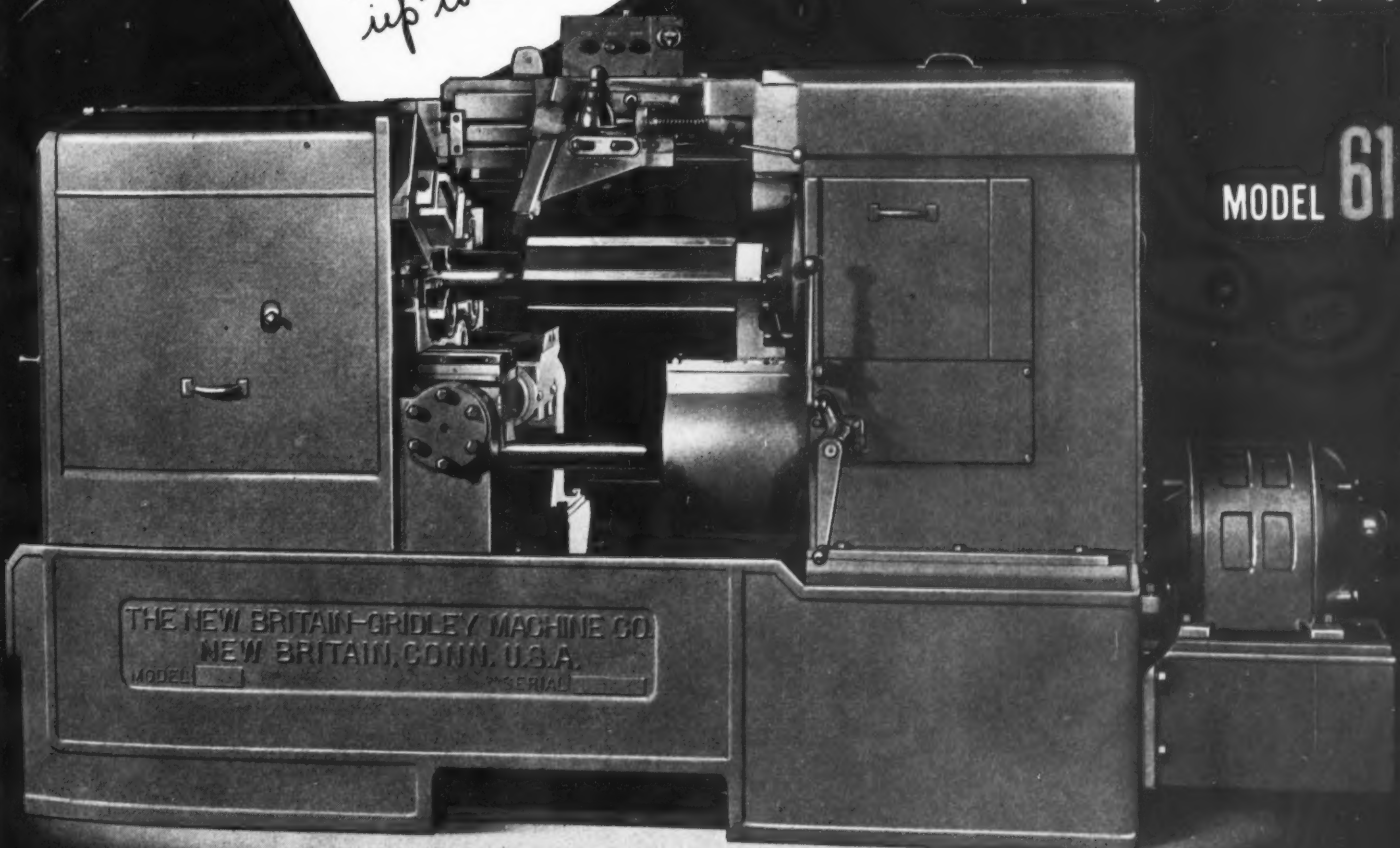
*New Britain adds to
its already modern
line a complete
new series of six
spindle Automatic
Screw Machines
up to 2 1/4" Capacity*

AUTOMATIC SCREW MACHINES

Six Spindles up to 2 1/4" Capacity
also

Four Spindles up to 3" Capacity

MODEL 61



Also a complete new line of Chuckers — 4 and 6 Spindles up to 9" Capacity

THE NEW BRITAIN-GRIDLEY MACHINE COMPANY

NEW BRITAIN, CONNECTICUT, U.S.A.

Wisconsin, Iowa and Illinois

L. W. GROTHAUS was recently elected vice-president of the Allis-Chalmers Mfg. Co., Milwaukee, Wis. He has been associated with the company for the last thirty-two years, having had wide experience in both the engineering and selling ends of the business. In 1925 he was made assistant manager of the electrical division, first at Norwood and then at Milwaukee, and since 1933 has been assistant to the president.

WESTCO PUMP CORPORATION, Davenport, Iowa, announces that a merger has been effected with the Micro Corporation, of Bettendorf, Iowa. The new concern will be known as Micro-Westco, Inc., and will be located in the Bettendorf Office Building, Bettendorf, Iowa. There will be no change in the personnel of either of the companies.

NEW BRITAIN-GRIDLEY MACHINE CO., New Britain, Conn., has appointed J. LESLIE LENTON direct western representative of the company, with headquarters at Chicago, Ill. Mr. Lenton has had many years of experience in connection with multiple-spindle automatic screw and chucking machines.

RAWLPLUG CO., INC., 98 Lafayette St., New York City, has opened a branch office in Chicago, of which J. W. GLEASON will be in charge. Mr. Gleason was previously general manager of the Knapp Bros. Mfg. Co., Joliet, Ill.

COMING EVENTS

JUNE 29-JULY 3—Thirty-ninth annual meeting of the AMERICAN SOCIETY FOR TESTING MATERIALS at the Chalfonte-Haddon Hall Hotel, Atlantic City, N. J. R. E. Hess, assistant secretary, 260 S. Broad St., Philadelphia, Pa.

AUGUST 30-SEPTEMBER 3—INDUSTRIAL AND TRADE FAIR at Leipzig, Germany. Further information may be obtained from Leipzig Trade Fair, Inc., 10 E. 40th St., New York City.

SEPTEMBER 16-19—Meeting of the AMERICAN SOCIETY OF MECHANICAL ENGINEERS at Niagara Falls, N. Y. C. E. Davies, secretary, 29 W. 39th St., New York City.

OCTOBER 5-10—FOURTH ANNUAL INDUSTRIAL MATERIALS EXHIBIT to be held at the Hotel Roosevelt, New York City. For information, address News Bureau, Industrial Materials Exhibit, care of Don Masson, Bakelite Corporation, 247 Park Ave., New York City.

OCTOBER 19-23—NATIONAL METAL CONGRESS, sponsored by the American So-

cieté for Metals, the American Welding Society, the Wire Association, the Institute of Metals and the Iron and Steel Divisions of the American Institute of Mining and Metallurgical Engineers, to be held in the Cleveland Public Auditorium, Cleveland, Ohio.

OCTOBER 19-23—Annual METAL EXPOSITION to be held in the Public Auditorium, Cleveland, Ohio, under the auspices of the American Society for Metals. W. H. Eisenman, secretary, American Society for Metals, 7016 Euclid Ave., Cleveland, Ohio, managing director of the exposition.

OCTOBER 22-23—Meeting of the AMERICAN SOCIETY OF MECHANICAL ENGINEERS

at Cleveland, Ohio, devoted to a symposium on welding practice, under the auspices of the Machine Shop Practice Division. C. E. Davies, secretary, 29 W. 39th St., New York City.

NOVEMBER 30-DECEMBER 4—Annual meeting of the AMERICAN SOCIETY OF MECHANICAL ENGINEERS in New York City. C. E. Davies, secretary, 29 W. 39th St., New York City.

NOVEMBER 30-DECEMBER 5—NATIONAL EXPOSITION OF POWER AND MECHANICAL ENGINEERING to be held at the Grand Central Palace, New York City. For further information, address Charles F. Roth, manager, Grand Central Palace, New York City.

NEW BOOKS AND PUBLICATIONS

PLATFORM FOR AMERICA. By Ralph E. Flanders. 118 pages, 5 1/2 by 8 1/2 inches. Published by Whittlesey House, McGraw-Hill Book Co., Inc., 330 W. 42nd St., New York City. Price, \$1.

The author of this book, president of the Jones & Lamson Machine Co., past-president of the American Society of Mechanical Engineers, and past-president of the National Machine Tool Builders' Association, is well known throughout the machinery industry and engineering circles. Those who know Mr. Flanders as a writer on economic subjects will welcome his latest work, being confident that they will find in it stimulating ideas and practical suggestions well worth pondering. And they will not be disappointed.

In his "Platform for America," Mr. Flanders analyzes, with his usual clear logic and lucid style, the problems with which industry is now confronted—both in relation to government and to the consuming public. He shows how prosperity and plenty for all depend upon increasingly greater production instead of restricted output. He discusses the relations of agriculture, business, and labor, showing that no policy or legislation that benefits one of these groups at the expense of the others will ultimately benefit any one of them, nor the country as a whole.

Combining high ideals for social welfare with a practical understanding of business problems and a fundamental knowledge of economics, Mr. Flanders is qualified to put his finger on the weak spots in our industrial and economic system and in our present political policies. But he is not content to point out our shortcomings—he goes on to suggest practical methods of overcoming them. He suggests definite "planks" for business, agriculture, labor, banking, and

government in attaining the common objective of "making available to all worthy citizens of our country the material and spiritual goods which our civilization can richly supply." This is a "platform" which transcends the narrow confines of political affiliations and commends itself to all those who seriously desire to find a means of furthering the social welfare, not of any one group, but of the people as a whole.

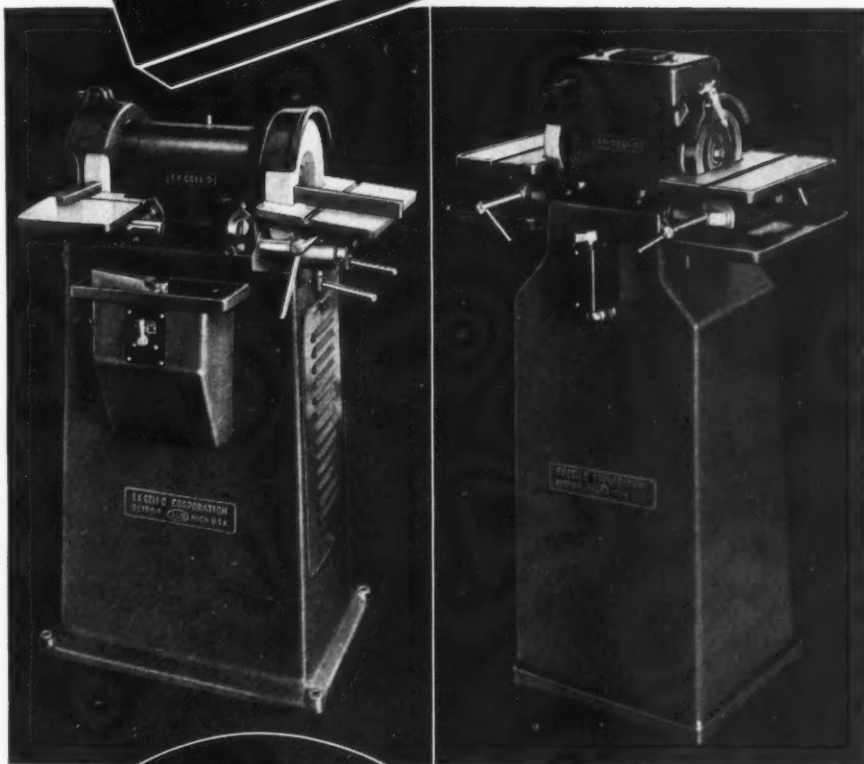
LIVING-TOGETHER IN A POWER AGE. By Samuel S. Wyer. 231 pages, 6 by 9 inches. Published by the Association Press, 347 Madison Ave., New York City. Price, \$2.50.

This book is of considerable interest, because of the timeliness of the subject and because of its presentation of many important facts relating to our economic problems. The author is a well-known engineer who has given considerable study to the causes underlying the maladies with which our economic and social system is afflicted.

He opens his discussion with an analysis of how we got into the present economic muddle; then he proceeds to show the effect on the social structure of the development and utilization of power. The book is filled with definite data and contains many charts and illustrations of facts on which the author's conclusions are based. The farm situation, government ownership, and some of the outstanding features of various economic systems are discussed from a common-sense point of view, devoid of prejudice.

However, while the author seems to see clearly certain basic defects, his suggestions for remedying them are stated in such general terms, and appear to be so lacking in appreciation of fundamentals, that they are of little value. When it comes to the subject of taxa-

Production Insurance



With Ex-Cell-O tungsten carbide tool grinders you duplicate new tool performance at each sharpening. Produce accurate reproductions of tool shapes and sharper tools, with the removal of a minimum of tungsten carbide stock. Results—more pieces per grind, more sharpenings per tool, and lower cost. In actual use Ex-Cell-O carbide tool grinders have proven that they pay for themselves many times over. A type for every purpose. Complete information upon request.

EX-CELL-O

AIRCRAFT
& TOOL

CORPORATION

DETROIT.
MICHIGAN



COUPON

Please send me descriptive literature on XLO products as indicated below :

① ② ③ ④ ⑤ ⑥ ⑦ ⑧

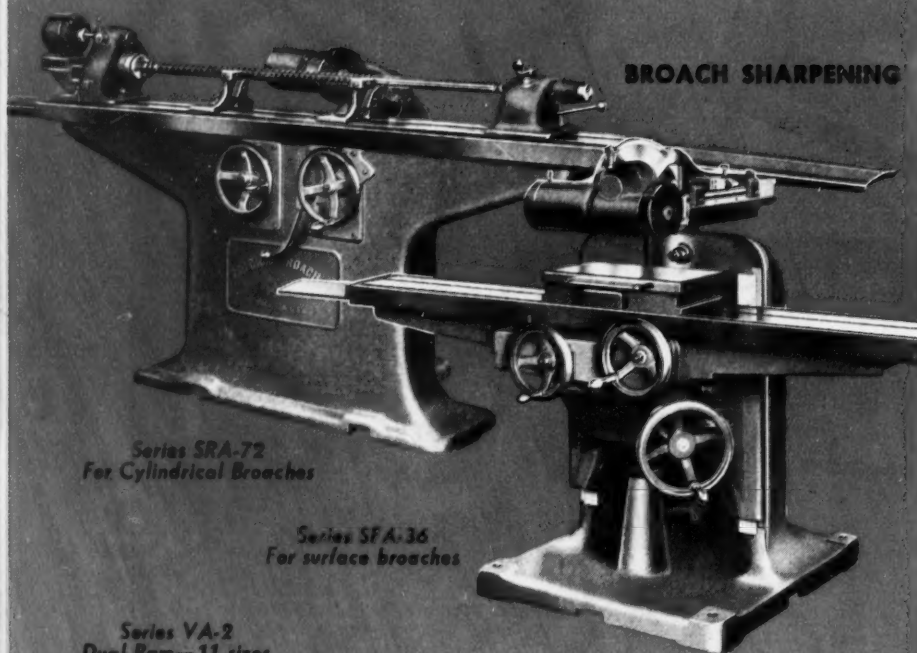
Name _____

Position _____

Company _____

City and State _____

COLONIAL COVERS THE POPULAR PRICE



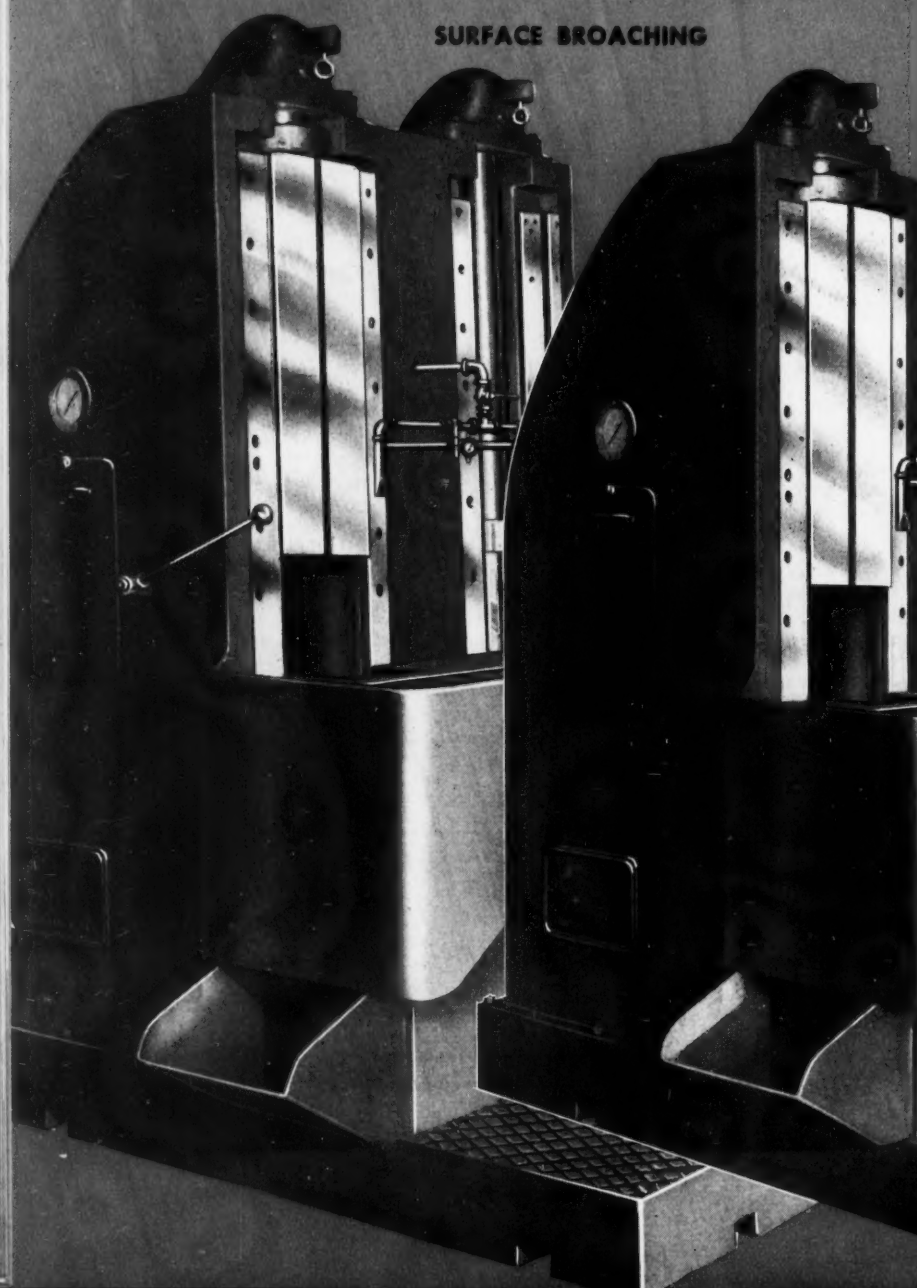
BROACH SHARPENING

Series SRA-72
For Cylindrical Broaches

Series SFA-36
For surface broaches

Series VA-2
Dual Ram—11 sizes

SURFACE BROACHING



Series VA-1
Single Ram
—11 sizes

Series HB-1
High Speed Pot

Announcing

a complete line • 11
basic types • 49 models
• Developed to cover the
entire broaching field.

For every requirement •
for surface or internal
broaching • heavy duty or
high speed • for large work
or small • there is now a
popular priced standard
Colonial machine.

"Unit" built for flexibility
• Adaptable to continuous
feed fixtures • Fixed or
variable speed control.

COLONIAL BROACH COMPANY
147 Jos. Campau • Detroit, Michigan

BROACHING FIELD with STANDARD MACHINERY

BROACHING PRESSES

Series YK-1
Power Presses—
Full range of sizes

THE
"PULLUP"
LINE

COLONIAL
PULLUP

COLONIAL
PULLUP

COLONIAL
UTILITY

Series VC-1
Light Duty—3 sizes

Series VG-1
Heavy Duty—5 sizes

Series VB-1
Utility Press
—7 sizes

Series VF-1
Light Duty—3 sizes

COLONIAL

Series HA-1
Universal
Horizontal
—6 sizes

g
11
els
he
.
al
or
ork
y a
ard
ity
ous
or
ol.
NY
gan

HD-1
Speed Puller

COLONIAL BROWN
DETANT

tion, he does not seem to distinguish between a taxation system based on confiscatory measures and one based on payment for services received; obviously, no government has a right to tax except where it renders a service in return. Yet a rational system of taxation is as important in solving our problems as any of the other proposals made. Hence, while there will be many who do not agree with all the conclusions drawn, the book, on the whole, should prove thought-provocative.

NEW-METHOD ESTIMATORS HANDBOOK. 1096 pages, 7 by 10 1/4 inches. Published by the New-Method Engineering Corporation, 4753 Broadway, Chicago, Ill. Price, \$15.

This is a book intended for estimators, superintendents, managers, engineers, draftsmen, time study departments, manufacturing departments, stock-rooms, production managers, material clerks, foremen, set-up men, cost departments, inventory clerks, and all those concerned with estimating production costs and time and material requirements.

The book is divided into nine sections, containing tables for estimating the required amount of round, square, hexagon, and flat steel and brass stock required for 1000 pieces. The sections giving figures for estimating material requirements contain preliminary instructions, a table for conversion to other materials, tables of diameters, or sizes and gages, and tables of weights and the number of linear feet required for 1000 pieces. One section contains tables for estimating the production costs and time required for 1000 pieces. The value of the data is enhanced by the extremely wide scope covered, figures being given for lengths ranging from 1/64 inch up to 1 inch in increments of 1/64 inch, and from 1 to 12 inches in increments of 1 inch, and in a wide range of widths. The tables for flat stock cover many different thicknesses, from 0.004 inch to 1 inch for steel and from 0.0031 inch to 1 inch for brass. Thus, millions of different material weights, time elements, and costs are presented, making it possible to obtain data directly, without calculations, for almost any combination of sizes. Obviously, the book should be of great time-saving value in estimating and cost departments.

BROACHES. By M. M. Zinde. 150 pages, 5 1/2 by 8 1/2 inches. Published by the Machinery Publishing Co., Ltd., 52-54 High Holborn, London, W.C. 1, England. Price, \$2.70, post paid.

Little has been published in book form on the subject of broaching up to the present time. While this operation has been employed in the metal-working industries for a number of years, it is only comparatively recently that it has had widespread application. Originally developed primarily for operations on parts that could not be readily machined by other means, the broaching process

has now been extended to embrace an endless variety of internal profiles and, more recently, to the finishing of external surfaces.

The object of this book is to afford an insight into the various problems of the broach designer and manufacturer and the manner in which they are overcome. It is based on the practice of leading broach manufacturers in this country. The material is divided into five chapters dealing with types of broaches; design of broaches; manufacture of broaches; broaching machines and fixtures; and the use and care of broaches. There are three appendixes giving production estimate for broaching operations on a connecting-rod; operation cards for broach manufacture; and calculation card for broaches. The definite design data and suggestions for application of this process should make this book a valuable addition to the library of the tool designer and user.

S A E HANDBOOK (1936 Edition). 776 pages, 5 1/2 by 8 1/2 inches. Published by the Society of Automotive Engineers, Inc., 29 W. 39th St., New York City. Price to members, \$2.50; to non-members, \$5.

The S A E Handbook includes all current standards and recommended practices adopted by the Society. New and revised specifications issued during any year are incorporated in the next issue of the Handbook. Specifications are standardized by the Society to promote interchangeability; eliminate variety; facilitate production, operation, and servicing; promote safety; advance uniformity in testing; and establish nomenclature. The book covers ten sections treating of the following subjects: Units, parts, and fittings; processed materials; fabricated materials; screws, bolts, and washers; tests, ratings, and codes; transportation and maintenance; tools and production equipment; nomenclature and definitions; miscellaneous and American standards, standards committee regulations; and general index.

ADVERTISING AND SELLING INDUSTRIAL GOODS. By Vergil D. Reed. 287 pages, 6 by 9 inches. Published by the Ronald Press Co., 15 E. 26th St., New York City. Price, \$3.50.

This book is intended to serve as a guide to advertising and sales executives in marketing industrial goods. It gives special attention to the problems of small and medium-sized concerns having limited appropriations for advertising and sales promotion work. Fifteen years of experience with a wide variety of industrial goods in both foreign and domestic markets form the background of the work. The plans and methods outlined are those that have proved successful in actual practice in a wide range of industries. No stress is given to the mechanical or production phases of advertising.

The material is divided into twelve chapters discussing the following subjects: The Field of Industrial Advertising;

Giving the Product an Advertisable Individuality; Buying Motives and Advertising Appeals; Analyzing the Industrial Market; Organization for Industrial Advertising; The Advertising Agency in Industrial Advertising; Building the Catalogue and Assuring Its Use; Media—Trade and Business Publications; Media—Direct Mail and Other Types; Industrial Copy and Art Work; Some Representative Industrial Campaigns; and Consumer Tie-Up for the Industrial Product.

TRAFFIC DICTIONARY. By C. S. Nelson and George T. Stuffebeam. 224 pages, 4 1/2 by 6 inches. Published by the Shipping Service Organization, 259 Broadway, New York City. Price, \$1.25.

Third edition of a little book containing a complete glossary of terms used in marketing, trade, and distribution. It gives definitions, as well as abbreviations in common use. It includes the names of organizations, publications, documents, equipment, and services employed in the preparation, recording, and handling of shipments by every means of transportation, covering as well warehousing, terminal, and transfer facilities, legal terms with reference to shipments, etc. Those who are concerned with traffic management or shipping will doubtless be glad to know of the availability of this dictionary.

THE STORY OF A PROFITABLE INDUSTRIAL COOPERATIVE IDEA. 32 pages, 9 by 12 inches. Published by the Power Transmission Council, 1 Atlantic St., Stamford, Conn.

This booklet contains a report to the members of Mechanical Power Engineering Associates and the Power Transmission Council, showing the progress made by this organization in market rebuilding enterprises for power transmission equipment during the past year.

OBITUARIES

FREDERICK ROLLIN WHITE, chairman of the board and former president of the Baker-Raulang Co., Cleveland, Ohio, died at the Cleveland Clinic Hospital on May 13, after a brief illness. Mr. White was the son of one of the founders of the White Sewing Machine Co. He was graduated from Cornell University in 1895. At the time of his death, he was also a director in the American Ball Bearing Co., the Caxton Building Co., and the Dynoc Co.

SYDNEY A. SMITH, manager of the gear department of the Meisel Press Mfg. Co., Boston, Mass., died suddenly on May 25. He had been in the employ of the company for twenty-eight years.



**THESE THREE HAVE
WON THEIR STRIPES
IN SERVICE**

“AGRIPPA” TOOL HOLDERS

• All “Agrippas” are drop-forged, carefully broached and specially hardened to insure a solid cutter-seat and a clean-cutting, chatter-proof tool. Their service record has earned them an enviable reputation as “The Holders that Hold.” Patterns for all regular operations of lathe, planer and shaper.

“VULCAN” HOIST HOOKS

• First choice of wise buyers for 40 years, “VULCANS” are drop-forged from specially selected steel. Heat-treated for maximum strength and toughness...individually proof-tested for safety. Furnished in both Shank and Eye patterns. Sizes, ½ to 25 tons. Look for the orange tip.

“VULCAN” EYE BOLTS

• Preferred for their safety, strength and dependability, Williams’ “Vulcan” Eye Bolts (weldless) are drop-forged, heat-treated and individually proof-tested. Plain and Shoulder patterns, shanks blank or threaded... complete range of sizes up to 16 tons capacity.

BUY FROM YOUR DISTRIBUTOR

J. H. WILLIAMS & CO.

75 Spring Street New York City

Headquarters for: Drop-Forged Wrenches (Carbon and Alloy), Detachable Socket Wrenches, “C” Clamps, Lathe Dogs, Tool Holders, Eye Bolts, Hoist Hooks, Thumb Nuts and Screws, Chain Pipe Tongs and Vises, etc.

WILLIAMS
SUPERIOR DROP-FORGED TOOLS

Classified Contents of this Number

DESIGN, FIXTURE AND TOOL

- Multi-Toothed Adjustable Sweep Tool for Face Milling—*By John A. Honegger*..... 723
- Jig Equipped with Quick-Acting Clamp—*By Edward Greenspon*..... 723
- Method that Insures Boring Split Bearing on Center Line—*By William M. Halliday*..... 724
- Hydraulically Operated Center and Pilot Support for Turret Lathe—*By I. F. Yeoman*..... 726

DESIGN, MACHINE

- Was This an Early Type of Ball or Roller Bearing?—*By Arthur H. Morse*..... 704
- Designing Cams for Automatic Screw Machines—*By I. A. Swidlo*..... 706
- Compact Clutch-Operating Mechanism for Gear-Box—*By F. H. Mayoh*..... 715
- Combination Cam and Parallel Motion for Guiding Spindle in Square Path—*By J. E. Fenno*..... 716
- Obtaining Two Reciprocating Motions from One Movement—*By L. Kasper*..... 717
- Can Herringbone Gears be Designed Like Spur Gears? 727
- Design Chart for Arc-Welded Products..... 734

DIEMAKING, DIE DESIGN, AND PRESS WORK

- An Adjustable Multiple Piercing Die..... 711
- Combination Blanking and Sizing Die—*By L. Kasper*..... 724
- Grid Piercing and Forming Die—*By F. Server*... 725
- An Under-Cut Die-Casting Requires Sliding Die Parts—*By Charles O. Herb*..... 729
- Two-Stage Piercing, Blanking, and Curling Die—*By Morell Johnson*..... 732

EDUCATION, TRADE AND ENGINEERING

- Is There a Place for the Young Engineering Graduate? 714

LUBRICANTS AND LUBRICATION

- Lubrication of Ball and Roller Bearings—*By H. T. Morton*..... 709
- Lubricating Under-Feed Waste-Packed Bearings.. 717
- Gear Lubrication Problem..... 728

MANAGEMENT PROBLEMS

- An Air-Conditioned Machine Shop Turns Out More Accurate Work—*By Charles O. Herb*..... 697
- History Repeats Itself in a World of Economic Illiteracy 704

What to Specify in Buying Press Dies—

- By John Relyea*..... 705
- Methods of Taxation Can Make or Break Industry 714
- Increased Employment Caused by Improved Machinery 714
- Our Economic System is Cooperative as Well as Competitive 726
- Savings Obtained through Using Diesel Engines.. 735

MATERIALS, METALS, AND ALLOYS

- Zinc or Zinc-Alloy Die-Castings..... 728
- Gray Iron Castings Are No Longer Just Cast Iron 735
- Armco "Stabilized" Steel for Deep-Drawing Operations 736
- Molybdenum-Iron Castings Withstand 3000-Pound Pressures 736
- Composition and Properties of Ford Crankshafts. 736
- Resins that are as Elastic as Rubber..... 737
- Molybdenum Cast Iron and Steel Used in Building Diesel Engines 737
- Permanent Magnets Hold the Work on a New Magnetic Chuck 737
- New Alloy Adopted for Electrical Resistance Standards 737

NEWS OF INDUSTRY

- Meeting of American Society for Testing Materials 711
- Engineering News Flashes..... 712
- Truck Production Reaches Record Height..... 718
- General Electric Commemorates a Fifty-Year Anniversary 731
- A New Industry Increases Demand for Machine Shop Equipment 731
- Westinghouse Builds a New Plant for Air-Conditioning Units 735
- Packard Provides Vacations and Retirement Pay for Factory Workers..... 735

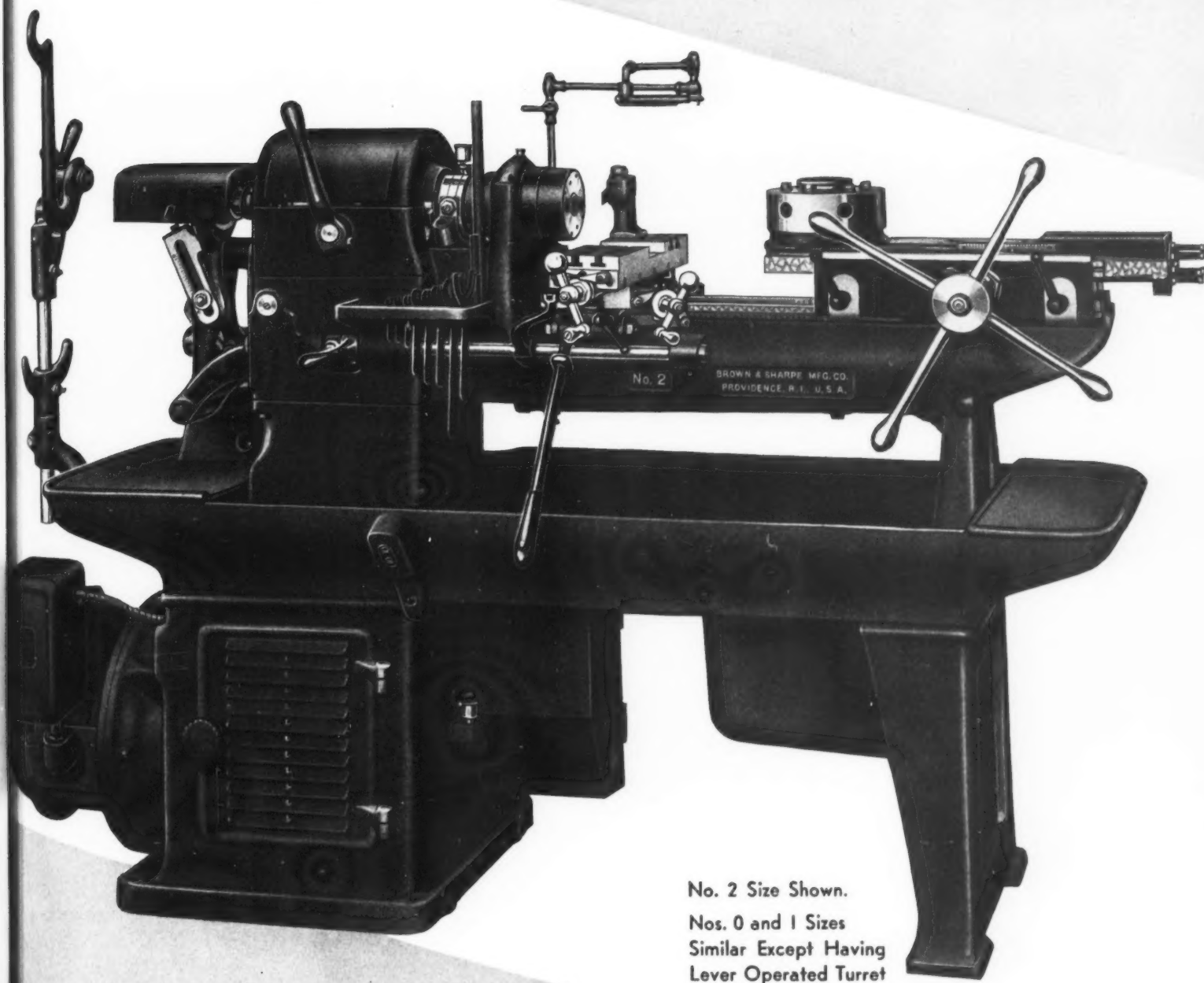
SHOP PRACTICE

- Producing Accurate Bores in Pressed-Steel Pulleys 700
- Grinding Wheel Truing Devices—*By William C. Betz*..... 701
- Jig for Drilling Elongated Holes—*By Arthur Signoretti*..... 718
- Hydraulic Work-Supporting Jack—*By J. A. Honegger*..... 718
- Custom-Built Machines Can be Tailored to Fit the Work—*By J. R. Johnson*..... 719
- Shop Equipment News..... 741

The New Design

BROWN & SHARPE

MOTOR DRIVEN - WIRE FEED SCREW MACHINES



No. 2 Size Shown.
Nos. 0 and 1 Sizes
Similar Except Having
Lever Operated Turret



**NEW
FEATURES**
... profitable on Short Runs
or Second Operations

- Higher Spindle Speeds
- Broader Range of Work
- High Ratio between Low and High Speeds
- Chain and Sprocket Drive for Low Speeds
- Positive Clamp for Turret Slide Bed

Also available in Belt Driven Types — May we send details?
Brown & Sharpe Mfg. Co., Providence, R. I., U. S. A.

COMING EVENTS

AUGUST 30-SEPTEMBER 3—INDUSTRIAL and TRADE FAIR at Leipzig, Germany. Further information may be obtained from Leipzig Trade Fair, Inc., 10 E. 40th St., New York City.

SEPTEMBER 16-19—Meeting of the AMERICAN SOCIETY OF MECHANICAL ENGINEERS at Niagara Falls, N. Y. C. E. Davies, secretary, 29 W. 39th St., New York City.

OCTOBER 5-10—FOURTH ANNUAL INDUSTRIAL MATERIALS EXHIBIT to be held at the Hotel Roosevelt, New York City. For information, address News Bureau, Industrial Materials Exhibit, care of Don Masson, Bakelite Corporation, 247 Park Ave., New York City.

OCTOBER 19-23—NATIONAL METAL CONGRESS, sponsored by the American Society for Metals, the American Welding Society, the Wire Association, the Institute of Metals and the Iron and Steel Divisions of the American Institute of Mining and Metallurgical Engineers, to be held in the Cleveland Public Auditorium, Cleveland, Ohio.

OCTOBER 19-23—Seventeenth annual meeting of the AMERICAN WELDING SOCIETY at the Hotel Cleveland, Cleveland, Ohio. Secretary, M. M. Kelly, 33 W. 39th St., New York City.

OCTOBER 19-23—Annual METAL EXPOSITION to be held in the Public Auditorium, Cleveland, Ohio, under the auspices of the American Society for Metals. W. H. Eisenman, secretary, American Society for Metals, 7016 Euclid Ave., Cleveland, Ohio, managing director of the exposition.

OCTOBER 22-23—Meeting of the AMERICAN SOCIETY OF MECHANICAL ENGINEERS at Cleveland, Ohio, devoted to a symposium on welding practice, under the

auspices of the Machine Shop Practice Division. C. E. Davies, secretary, 29 W. 39th St., New York City.

NOVEMBER 11-18—NATIONAL AUTOMOBILE SHOW, Grand Central Palace, New York City. Alfred Reeves, manager, 366 Madison Ave., New York City.

NOVEMBER 18-20—NATIONAL FOREIGN TRADE CONVENTION at Chicago, Ill. For further information, address National Foreign Trade Council, 26 Beaver St., New York City.

NOVEMBER 30-DECEMBER 4—Annual meeting of the AMERICAN SOCIETY OF MECHANICAL ENGINEERS in New York City. C. E. Davies, secretary, 29 W. 39th St., New York City.

NOVEMBER 30-DECEMBER 5—NATIONAL EXPOSITION OF POWER AND MECHANICAL ENGINEERING to be held at the Grand Central Palace, New York City. For further information, address Charles F. Roth, manager, Grand Central Palace, New York City.

* * *

New Departure Honors Employees of Long Standing

Two hundred and fifty-two of the older employees of the New Departure Division of the General Motors Corporation sat down to a dinner on July 1 at Bristol, Conn., given in their honor by the company. These men and women represented more than 6000 aggregate years of service with the New Departure company. Mr. Hughes, general manager of the plant, chose as the subject of his address at this event "6000 Years of New Departure Experience—its Meaning, Past, Present, and Future." The range of service of those present varied from twenty to forty-four years. Emblems were distributed, each five-year class having a different designation. Special note was taken of the three Heffernan brothers—Frank, Michael, and James—who have a combined service record of 101 years with the company. Six women have been with the company from twenty to forty-three years.

OBITUARIES

A. T. BRABYN, general master mechanic of the Buick Motor Co., Flint, Mich., died in Rochester, Minn., July 4. He had been with the Buick organization since 1908—a period of twenty-



A. T. Brabyn

eight years—starting from the ranks and later becoming assistant master mechanic. In 1934 he was promoted to general master mechanic.

ALFRED H. SCHUTTE of Köln-Deutz, Germany, senior partner in the firm of Alfred H. Schütte, died June 28 at the age of nearly eighty-two years. Mr. Schütte was well known to many American machine tool builders.

CHRISTIAN P. BERG, well-known engineer in the shop management field, who since 1932 was with the Link-Belt Co., Chicago, Ill., died on July 4.



Charles M. Hoover, upon the completion of sixty-one years of continuous service with Henry Disston & Sons, Inc., Philadelphia, Pa., receiving a box of cigars and a check from the company in commemoration of the event, handed to him by S. Horace Disston, vice-president and general manager of the company. Mr. Hoover, who was born in 1861, started to work in the Disston plant as an apprentice sawmaker when he was just under 14 years old. He is today in excellent health and physical condition—more active than many men years younger than he is.

The
ARISTOCRAT
of Bearings



The use of Hoover Bearings is reserved for those manufacturers who seek out the finer things in the Mechanical World

H O O V E R
B A L L *and* B E A R I N G C O.

A N N A R B O R . . . M I C H I G A N

Classified Contents of this Number

DESIGN, FIXTURE AND TOOL

Hacksaw-Blade Simplified Practice	768
Automatic Two-Way Air Valve for Operating Turret Clamp— <i>By George L. Pyritz</i>	790
Chuck with Two Sets of Jaws for Centering Long Casting— <i>By F. Server</i>	791
Pressure Equalizing Attachment for Wire-Forming Slide— <i>By L. Kasper</i>	791

DESIGN, MACHINE

Typical Applications of Roller Bearings to Machine Tools— <i>By S. M. Weckstein</i>	774
Pulsating Rotary Movement for Operating Shell Hopper— <i>By J. E. Fenno</i>	783
Swivel Joint Mechanism for Changing Direction of Movement— <i>By F. Server</i>	784
Variable Feed Arrangement for Automatic Wheel- Dressing Device— <i>By John A. Honegger</i>	785

DIEMAKING, DIE DESIGN, AND PRESS WORK

Four Different Die-Castings from One Set of Dies— <i>By Charles O. Herb</i>	779
Die for Punching Two Holes in Tubing Simultaneously— <i>By Ben Clark</i>	789
Die Arranged for Economical Production of Pierced and Blanked Parts— <i>By Frank Serral</i> ..	792

DRAFTING-ROOM PRACTICE

Dimensioning Assemblies and Parts from a Common Point— <i>By C. W. Hinman</i>	796
Eraser of Spun Glass	820

GAGING AND INSPECTION

Measuring to Millionths Made Easy	800
---	-----

MANAGEMENT PROBLEMS

Cooling Small Shop Buildings in Summer— <i>By W. F. Schaphorst</i>	778
Advertising Tends to Reduce Prices and Raise Wages	782
Reciprocal Buying Does Not Promote Good Salesmanship	782
Firm's Responsibility for Salesman's Promises...	788
The Patent Lawyer as a Business Advisor— <i>By Joshua R. H. Potts</i>	799
Safety Device Assures Use of Goggles	820
Automobile Industry Leads the Way to Real Recovery	820
Government Interference with the American Industrial System	820

MATERIALS, METALS, AND ALLOYS

Composition of Crankshaft Cast Iron	788
New Nikrome Steel Suitable for Heavy-Duty Service	802
Stellite Employed for Other Purposes than Cutting Tools	802
A New Babbitt Intended for Heavy Impact Loads	802
Copper Sheetting as Thin as 0.001 Inch Produced by Electro-Deposition	802
Cars of Rust-Resisting Steel for the San Francisco- Oakland Bridge	803
Cements Containing Thiokol Available for Various Industrial Uses	803
Palladium Resists Tarnishing under Humid Conditions	803
Metallurgy in the Automobile Industry	819

NEWS OF INDUSTRY

Cleveland Twist Drill Co. Celebrates Sixtieth Anniversary	773
Engineering News Flashes	780
Engineering Association Changes Name	785
Norma-Hoffmann Announces Improvements	806
Detroit Engineers Give Vocational Guidance to High-School Students	819
Norma-Hoffmann Has a Twenty-Five Year Anniversary	820
News of the Industry	821

SHOP PRACTICE

What!—Riveting a Silent Operation?— <i>By Charles O. Herb</i>	761
What Do We Gain by Using Ground-Thread Taps?— <i>By H. Goldberg</i>	765
From White Hot Slab to a Strip of Sheet Steel in Two Minutes	766
Precision Operations in the Manufacture of Turret Lathe Spindles— <i>By William J. Burger</i>	769
Engineering Required in Manufacturing as Well as in Design	782
Ball Bearings on Out-of-Round Shafts— <i>By John E. Hyler</i>	785
Boring, Facing, and Chamfering Gear-Pump Bodies	786
Broaching Integrally Cast Main Bearing Caps ...	787
Chromium-Plated Cutting Tools	792
Emergency Dividing Engine for Graduating Small Disks— <i>By Willis H. Sargent</i>	793
Bushing Large Collets for Use on Small Work— <i>By R. A. Dressler</i>	793
Quantity Production of One Hundred Different Parts by Two Machines	794
Shop Equipment News	807

MACHINERY'S DATA SHEETS 305 and 306

SHOP MEASUREMENTS for WOODRUFF KEYS and KEYWAYS—5

Woodruff Key Size	Shaft Diameter	Bottom of Keyway to Opposite Side		Top of Key to Opposite Side		Bottom of Keyway to Opposite Side	
		H		J		K	
		Min.	Max.	Min.	Max.	Min.	Max.
1/4 by 1/8	15/16	0.3199	0.5249	1.0619	1.0719	1.0729	1.0779
	1	0.3375	0.5425	1.0809	1.0909	1.0919	1.0969
	1 1/16	0.3550	0.5600	1.1000	1.1100	1.1110	1.1160
	1 1/8	0.3725	0.5775	1.1191	1.1291	1.1301	1.1351
	1 1/4	0.3900	0.5950	1.1382	1.1482	1.1492	1.1542
	1 1/2	0.4075	0.6125	1.1573	1.1673	1.1683	1.1733
	1 3/4	0.4250	0.6300	1.1764	1.1864	1.1874	1.1924
	2	0.4425	0.6475	1.1955	1.2055	1.2065	1.2115
	2 1/8	0.4600	0.6650	1.2146	1.2246	1.2256	1.2306
	2 1/4	0.4775	0.6825	1.2337	1.2437	1.2447	1.2497
	2 1/2	0.4950	0.7000	1.2528	1.2628	1.2638	1.2688
	2 3/4	0.5125	0.7175	1.2719	1.2819	1.2829	1.2879
	3	0.5300	0.7350	1.2910	1.3010	1.3020	1.3070
	3 1/8	0.5475	0.7525	1.3101	1.3201	1.3211	1.3261
	3 1/4	0.5650	0.7700	1.3292	1.3392	1.3402	1.3452
	3 1/2	0.5825	0.7875	1.3483	1.3583	1.3593	1.3643
	3 3/4	0.6000	0.8050	1.3674	1.3774	1.3784	1.3834
	4	0.6175	0.8225	1.3865	1.3965	1.3975	1.4025
	4 1/8	0.6350	0.8400	1.4056	1.4156	1.4166	1.4216
	4 1/4	0.6525	0.8575	1.4247	1.4347	1.4357	1.4407
	4 1/2	0.6700	0.8750	1.4438	1.4538	1.4548	1.4598
	4 3/4	0.6875	0.8925	1.4629	1.4729	1.4739	1.4789
	5	0.7050	0.9100	1.4820	1.4920	1.4930	1.4980
	5 1/8	0.7225	0.9275	1.5011	1.5111	1.5121	1.5171
	5 1/4	0.7400	0.9450	1.5202	1.5302	1.5312	1.5362
	5 1/2	0.7575	0.9625	1.5393	1.5493	1.5503	1.5553
	5 3/4	0.7750	0.9800	1.5584	1.5684	1.5694	1.5744
	6	0.7925	0.9975	1.5775	1.5875	1.5885	1.5935
	6 1/8	0.8100	1.0150	1.5966	1.6066	1.6076	1.6126
	6 1/4	0.8275	1.0325	1.6157	1.6257	1.6267	1.6317
	6 1/2	0.8450	1.0500	1.6348	1.6448	1.6458	1.6508
	6 3/4	0.8625	1.0675	1.6539	1.6639	1.6649	1.6699
	7	0.8800	1.0850	1.6730	1.6830	1.6840	1.6890
	7 1/8	0.8975	1.1025	1.6921	1.7021	1.7031	1.7081
	7 1/4	0.9150	1.1200	1.7112	1.7212	1.7222	1.7272
	7 1/2	0.9325	1.1375	1.7303	1.7403	1.7413	1.7463
	7 3/4	0.9500	1.1550	1.7494	1.7594	1.7604	1.7654
	8	0.9675	1.1725	1.7685	1.7785	1.7795	1.7845
	8 1/8	0.9850	1.1900	1.7876	1.7976	1.7986	1.8036
	8 1/4	1.0025	1.2075	1.8067	1.8167	1.8177	1.8227
	8 1/2	1.0200	1.2250	1.8258	1.8358	1.8368	1.8418
	8 3/4	1.0375	1.2425	1.8449	1.8549	1.8559	1.8609
	9	1.0550	1.2600	1.8640	1.8740	1.8750	1.8800
	9 1/8	1.0725	1.2775	1.8831	1.8931	1.8941	1.8991
	9 1/4	1.0900	1.2950	1.9022	1.9122	1.9132	1.9182
	9 1/2	1.1075	1.3125	1.9213	1.9313	1.9323	1.9373
	9 3/4	1.1250	1.3300	1.9404	1.9504	1.9514	1.9564
	10	1.1425	1.3475	1.9595	1.9695	1.9705	1.9755
	10 1/8	1.1600	1.3650	1.9786	1.9886	1.9896	1.9946
	10 1/4	1.1775	1.3825	1.9977	2.0077	2.0087	2.0137
	10 1/2	1.1950	1.4000	2.0168	2.0268	2.0278	2.0328
	10 3/4	1.2125	1.4175	2.0359	2.0459	2.0469	2.0519
	11	1.2300	1.4350	2.0550	2.0650	2.0660	2.0710
	11 1/8	1.2475	1.4525	2.0741	2.0841	2.0851	2.0901
	11 1/4	1.2650	1.4700	2.0932	2.1032	2.1042	2.1092
	11 1/2	1.2825	1.4875	2.1123	2.1223	2.1233	2.1283
	11 3/4	1.3000	1.5050	2.1314	2.1414	2.1424	2.1474
	12	1.3175	1.5225	2.1505	2.1605	2.1615	2.1665
	12 1/8	1.3350	1.5400	2.1696	2.1796	2.1806	2.1856
	12 1/4	1.3525	1.5575	2.1887	2.1987	2.1997	2.2047
	12 1/2	1.3700	1.5750	2.2078	2.2178	2.2188	2.2238
	12 3/4	1.3875	1.5925	2.2269	2.2369	2.2379	2.2429
	13	1.4050	1.6100	2.2460	2.2560	2.2570	2.2620
	13 1/8	1.4225	1.6275	2.2651	2.2751	2.2761	2.2811
	13 1/4	1.4400	1.6450	2.2842	2.2942	2.2952	2.2999
	13 1/2	1.4575	1.6625	2.3033	2.3133	2.3143	2.3193
	13 3/4	1.4750	1.6800	2.3224	2.3324	2.3334	2.3384
	14	1.4925	1.6975	2.3415	2.3515	2.3525	2.3575
	14 1/8	1.5100	1.7150	2.3606	2.3706	2.3716	2.3766
	14 1/4	1.5275	1.7325	2.3797	2.3897	2.3907	2.3957
	14 1/2	1.5450	1.7500	2.3988	2.4088	2.4098	2.4148
	14 3/4	1.5625	1.7675	2.4179	2.4279	2.4289	2.4339
	15	1.5800	1.7850	2.4370	2.4470	2.4480	2.4530
	15 1/8	1.5975	1.8025	2.4561	2.4661	2.4671	2.4721
	15 1/4	1.6150	1.8200	2.4752	2.4852	2.4862	2.4912
	15 1/2	1.6325	1.8375	2.4943	2.5043	2.5053	2.5103
	15 3/4	1.6500	1.8550	2.5134	2.5234	2.5244	2.5294
	16	1.6675	1.8725	2.5325	2.5425	2.5435	2.5485
	16 1/8	1.6850	1.8900	2.5516	2.5616	2.5626	2.5676
	16 1/4	1.7025	1.9075	2.5707	2.5807	2.5817	2.5867
	16 1/2	1.7200	1.9250	2.5898	2.5998	2.6008	2.6058
	16 3/4	1.7375	1.9425	2.6089	2.6189	2.6199	2.6249
	17	1.7550	1.9600	2.6280	2.6380	2.6390	2.6440
	17 1/8	1.7725	1.9775	2.6471	2.6571	2.6581	2.6631
	17 1/4	1.7900	1.9950	2.6662	2.6762	2.6772	2.6822
	17 1/2	1.8075	2.0125	2.6853	2.6953	2.6963	2.7013
	17 3/4	1.8250	2.0300	2.7044	2.7144	2.7154	2.7204
	18	1.8425	2.0475	2.7235	2.7335	2.7345	2.7395
	18 1/8	1.8600	2.0650	2.7426	2.7526	2.7536	2.7586
	18 1/4	1.8775	2.0825	2.7617	2.7717	2.7727	2.7777
	18 1/2	1.8950	2.1000	2.7808	2.7908	2.7918	2.7968
	18 3/4	1.9125	2.1175	2.7999	2.8099	2.8109	2.8159
	19	1.9300	2.1350	2.8190	2.8290	2.8300	2.8350
	19 1/8	1.9475	2.1525	2.8381	2.8481	2.8491	2.8541
	19 1/4	1.9650	2.1700	2.8572	2.8672	2.8682	2.8732
	19 1/2	1.9825	2.1875	2.8763	2.8863	2.8873	2.8923
	19 3/4	2.0000	2.2050	2.8954	2.9054	2.9064	2.9114
	20	2.0175	2.2225	2.9145	2.9245	2.9255	2.9305
	20 1/8	2.0350	2.2400	2.9336	2.9436	2.9446	2.9496
	20 1/4	2.0525	2.2575	2.9527	2.9627	2.9637	2.9687
	20 1/2	2.0700	2.2750	2.9718	2.9818	2.9828	2.9878
	20 3/4	2.0875	2.2925	2.9909	3.0009	3.0019	3.0069
	21	2.1050	2.3100	3.0100	3.0200	3.0210	3.0260
	21 1/8	2.1225	2.3275	3.0291	3.0391	3.0401	3.0451
	21 1/4	2.1400	2.3450	3.0482	3.0582	3.0592	3.0642
	21 1/2	2.1575	2.3625	3.0673	3.0773	3.0783	3.0833
	21 3/4	2.1750	2.3800	3.0864	3.0964	3.0974	3.1024
	22	2.1925	2.3975	3.1055	3.1155	3.1165	3.1215
	22 1/8	2.2100	2.4150	3.1246	3.1346	3.1356	3.1406
	22 1/4	2.2275	2.4325	3.1437	3.1537	3.1547	3.1597
	22 1/2	2.2450	2.4500	3.1628	3.1728	3.1738	3.1788
	22 3/4	2.2625	2.4675	3.1819	3.1919	3.1929	3.1979
	23	2.2800	2.4850	3.2010	3.2110	3.2120	3.2170
	23 1/8	2.2975	2.5025	3.2201	3.2301	3.2311	3.2361
	23 1/4	2.3150	2.5200	3.2392	3.2492	3.2502	3.2552
	23 1/2	2.3325	2.5375	3.2583	3.2683	3.2693	3.2743
	23 3/4	2.3500	2.5550	3.2774	3.2874	3.2884	3.2934
	24	2.3675	2.5725	3.2965	3.3065	3.3075	3.3125
	24 1/8	2.3850	2.5900	3.3156	3.3256	3.3266	3.3316
	24 1/4	2.4025	2.6075	3.3347	3.3447	3.3457	3.3507
	24 1/2	2.4200	2.6250	3.3538	3.3638	3.3648	3.3698
	24 3/4	2.4375	2.6425	3.3729	3.3829	3.3839	3.3889
	25	2.4550	2.6600	3.3920	3.4020	3.4030	3.4080
	25 1/8	2.4725	2.6775	3.4111	3.4211	3.4221	3.4271
	25 1/4	2.4900	2.6950	3.4302	3.4402	3.4412	3.4462
	25 1/2	2.5075	2.7125	3.4493	3.4593	3.4603	3.4653
	25 3/4	2.5250	2.7300	3.4684	3.4784	3.4794	3.4844
	26	2.5425	2.7475	3.4875	3.4975	3.4985	3.5035
	26 1/8	2.5600	2.7650	3.5066	3.5166	3.5176	3.5226
	26 1/4	2.5775	2.7825	3.5257	3.5357	3.5367	3.5417
	26 1/2	2.5950	2.8000	3.5448	3.5548	3.5558	3.5608
	26 3/4	2.6125	2.8175	3.5639	3.5739	3.5749	3.5799
	27	2.6300	2.8350	3.5830	3.5930	3.5940	3.5990
	27 1/8	2.6475	2.8525	3.6021	3.6121	3.6131	3.6181
	27 1/4	2.6650	2.8700	3.6212	3.6312	3.6322	3.6372
	27 1/2	2.6825	2.8875	3.6403	3.6503	3.6513	3.6563
	27 3/4	2.7000	2.9050	3.6594	3.6694	3.6704	3.6754
	28	2.7175	2.9225	3.6785	3.6885	3.6895	3.6945
	28 1/8	2.7350	2.9400	3.6976	3.7076	3.7086	3.7136
	28 1/						

MACHINERY'S DATA SHEETS 307 and 308

APPLICATIONS OF S A E STEELS—1

Product or Application	Steels Used, S A E No.	Heat-Treatment (See Numbered Footnotes)	Product or Application	Steels Used, S A E No.	Heat-Treatment (See Numbered Footnotes)
Agricultural Implements			Axle shafts (continued) ..	3135	6, 5, 11
Cultivator disks	1075	9, 6, 5		3140	6, 11, 5
Harrow disks	1090	10, 6, 4, 5		3245	10, 6
Mower knives	1085	10, 6, 5	Balls, carbon steel	1090	10, 6, 4, 5
Mower sections	1070	9, 6, 5		1095	10, 6, 4, 5
Plow beams	1070	9, 6, 5	Balls for bearings	52100	6, 4, 5
Plowshares and disks ...	1080	10, 6, 5		6195	6, 4, 5
Seeder disks	1090	10, 6, 4, 5	Bearings subject to corrosion	51335	6, 5
Shovels	1080	10, 6, 5	Bolts, connecting-rod	3125	6, 11
Springs for seats	1090	10, 6, 4, 5		3130	6, 11
Aircraft forgings	4140	10, 6, 5	Bolts, heat-treated	2330	6, 9
Aircraft material (strip, sheet)	4130	9, 6		2335	6, 9
Automobile body and panel material	1010		Bolts for hubs and rims...	X1025	6, 8, 7, 4, 5
Automobile body trim (stainless)	51510		Bolts for steering arm....	3125	6, 11
Axles	4130	9, 6		3130	6, 11
	4140	10, 6, 5	Bracketa	1030	6, 8, 4, 7, 5
	1040	6, 4, 5, 8	Bumper bars	1035	10, 6, 5
Axle shafts	1045	6, 4, 5, 11	Bushings (stainless)	51335	6, 5
	3250	10, 6	Cams, free-wheeling	4615	12, 2, 3, 5, 13
	4345	10, 6, 5		4620	12, 2, 3, 5, 13
	6135	10, 6, 5	Camshafts	1020	1, 2, 4, 5, 3, 13, 7
	6140	10, 6, 5	Clutch disks	1060	9, 6, 5
	2340	6, 5, 10		1070	9, 6, 5
	2345	6, 5, 10	Clutch fingers	1085	10, 6, 5
				1020	1, 2, 4, 5, 3, 13, 7

Several different heat-treatments are listed for most steels. That heat-treatment should be selected which will give the properties required, as determined by experience.

1. Carburize, quench direct and temper
2. Carburize, quench direct from furnace or carburizing box, reheat, quench and temper
3. Carburize, cool slowly or in carburizing box, reheat, quench and temper
4. Quench in water
5. Quench in oil
6. Heat, quench and temper to required hardness

That heat-treatment should be selected which will give the

7. Heat in cyanide or activated bath, quench and temper
8. Normalize, machine, heat, quench and temper to required hardness
9. Normalize or anneal to desired structure or machineability
10. Normalize and anneal to desired structure or machineability
11. Normalize, reheat, quench and temper to required hardness
12. Normalize above carburizing temperature
13. Reheat, quench in oil before tempering

MACHINERY'S Data Sheet No. 307, New Series, October, 1935

APPLICATIONS OF S A E STEELS—2

Product or Application	Steels Used, S A E No.	Heat-Treatment (See Footnotes on Data Sheet 307)	Product or Application	Steels Used, S A E No.	Heat-Treatment (See Footnotes on Data Sheet 307)
Connecting-rods	X3140	6, 10, 5	Gears, carburized	2315	1, 2, 5, 3, 13, 7
	6135	10, 6, 5		2320	1, 2, 5, 3, 13, 7
	6140	10, 6, 5		4615	12, 2, 5, 3, 13
Countershafts	3115	12, 2, 3, 13, 7		4620	12, 2, 5, 3, 13
	3120	12, 2, 3, 13, 7		4815	10, 2, 5, 3, 13
Covers, clutch, oil-pan, transmission, etc.	1010			4820	10, 2, 5, 3, 13
Crankshafts	1015		Gears, carburized, rear axle and transmission...	6115	12, 2, 5, 3, 13, 7
	3135	6, 5, 11		6120	12, 2, 5, 3, 13, 7
	3140	6, 5, 11		3312	12, 2, 5, 3, 13, 1
	X3140	6, 5, 10		3415	12, 2, 5, 3, 13, 1
	5140	10, 6, 5, 7	Gears, carburized, ring and pinion	3115	12, 2, 3, 13, 7
Crankshafts, Diesel engine.	4340	10, 6, 5		3120	12, 2, 3, 13, 7
Cutlery	51335	6, 5		3215	10, 2, 5, 3, 13
Deep-drawing strip (rimmed)	1010		Gears, casehardened by direct cyaniding	5140	10, 6, 5, 7
	1015			6135	10, 6, 5
Drawn and formed products	1010			6140	10, 6, 5
	1015		Gears, oil-hardened	2345	6, 5, 10
Drawn shapes (not deep drawn)	1020	1, 2, 3, 4, 5, 13, 7		2350	10, 6, 5
Fan blades	1020	1, 2, 3, 4, 5, 13, 7		3145	10, 6, 5
Fender stock	1010			3150	10, 6, 5
	1015			3245	10, 6
Forging materials	1020	1, 2, 3, 4, 5, 13, 7		3250	10, 6
	1025	6, 4, 8, 7		4340	10, 6, 5
	1035	6, 4, 5, 8		4345	10, 6, 5
	1040	6, 4, 5, 8		4640	10, 7, 6, 5
	1045	6, 4, 5, 11		5150	10, 6, 5
	1050	6, 4, 5, 11		6145	10, 6, 5
	X1050	6, 4, 5, 11	Key stock	1030	6, 4, 8, 7, 5
	2340	6, 5, 10		1090	10, 6, 4, 5
	3240	10, 6, 5		1095	10, 6, 4, 5
	3245	10, 6		2330	6, 9
	3250	10, 6		2335	6, 9
	3450	10, 6, 5		3125	6, 11
	5140	10, 6, 7, 5	Lamps (deep-drawing stock)	1010	
	6145	10, 6, 5		1015	

MACHINERY'S Data Sheet No. 308, New Series, October, 1935

CONFIDENTIAL - NO DISSEMINATION

SECRET

MACHINERY'S DATA SHEETS 309 and 310

APPLICATIONS OF SAE STEELS—3

Product or Application	Steels Used, SAE No.	Heat-Treatment (See Numbered Footnotes)	Product or Application	Steels Used, SAE No.	Heat-Treatment (See Numbered Footnotes)
Levers, brake and shift....	1030	6, 4, 8, 7, 5	Rivets, cold-heading	1010	—
Links for drive chains	3135	6, 5, 11		1015	—
	3140	6, 5, 11	Rivets (stainless)	51210	6, 5
Nuts	2330	6, 9	Rods (stainless)	51210	6, 5
	2335	6, 9	Roller bearings	4815	10, 2, 5, 3, 13
	3125	6, 11		4820	10, 2, 5, 3, 13
	3130	6, 11	Rollers for bearings	52100	6, 4, 5
	51210	6, 5		6195	6, 4, 5
Ornamental sheet and strip steel (corrosion-resisting)	51710	—	Screening (stainless)	51210	6, 5
Pins	1090	10, 6, 4, 5	Screws, machine	1020	1, 2, 3, 4, 5, 13, 7
Pins for chains.....	4815	10, 2, 5, 3, 13		1112	7, 4, 5
	4820	10, 2, 5, 3, 13		X1112	—
Pins, lock	1085	10, 6, 5		1115	1, 2, 3, 13, 7, 4, 5
Pins, piston	3115	12, 2, 3, 13, 7		1120	1, 2, 3, 13, 7, 4, 5
	3120	12, 2, 3, 13, 7		2330	6, 9
Pins, steering knuckle.....	4815	10, 2, 5, 3, 13		2335	6, 9
	4820	10, 2, 5, 3, 13		3135	6, 5, 11
Pins, wrist	1020	1, 2, 3, 4, 5, 13, 7		3140	6, 5, 11
Propeller shafts	2340	6, 5, 10		6135	10, 6, 5
	2345	6, 5, 10		6140	10, 6, 5
	4140	10, 6, 5	Shafts, spline	2340	6, 5, 10
	5140	10, 6, 5, 7		2345	6, 5, 10
	6135	10, 6, 5		3115	12, 2, 3, 13, 7
Races, ball and roller bearing	6140	10, 6, 5		3120	12, 2, 3, 13, 7
	52100	6, 4, 5		3135	6, 11, 5
	6195	6, 4, 5		3140	6, 11, 5
				5140	10, 6, 7, 5

Several different heat-treatments are listed for most steels. That heat-treatment should be selected which will give the properties required, as determined by experience.

1. Carburize, quench direct and temper
2. Carburize, quench direct from furnace or carburizing box, reheat, quench and temper
3. Carburize, cool slowly or in carburizing box, reheat, quench and temper
4. Quench in water
5. Quench in oil
6. Heat, quench and temper to required hardness
7. Heat in cyanide or activated bath, quench and temper
8. Normalize, machine, heat, quench and temper to required hardness
9. Normalize or anneal to desired structure or machineability
10. Normalize and anneal to desired structure or machineability
11. Normalize, reheat, quench and temper to required hardness
12. Normalize above carburizing temperature
13. Reheat, quench in oil before tempering

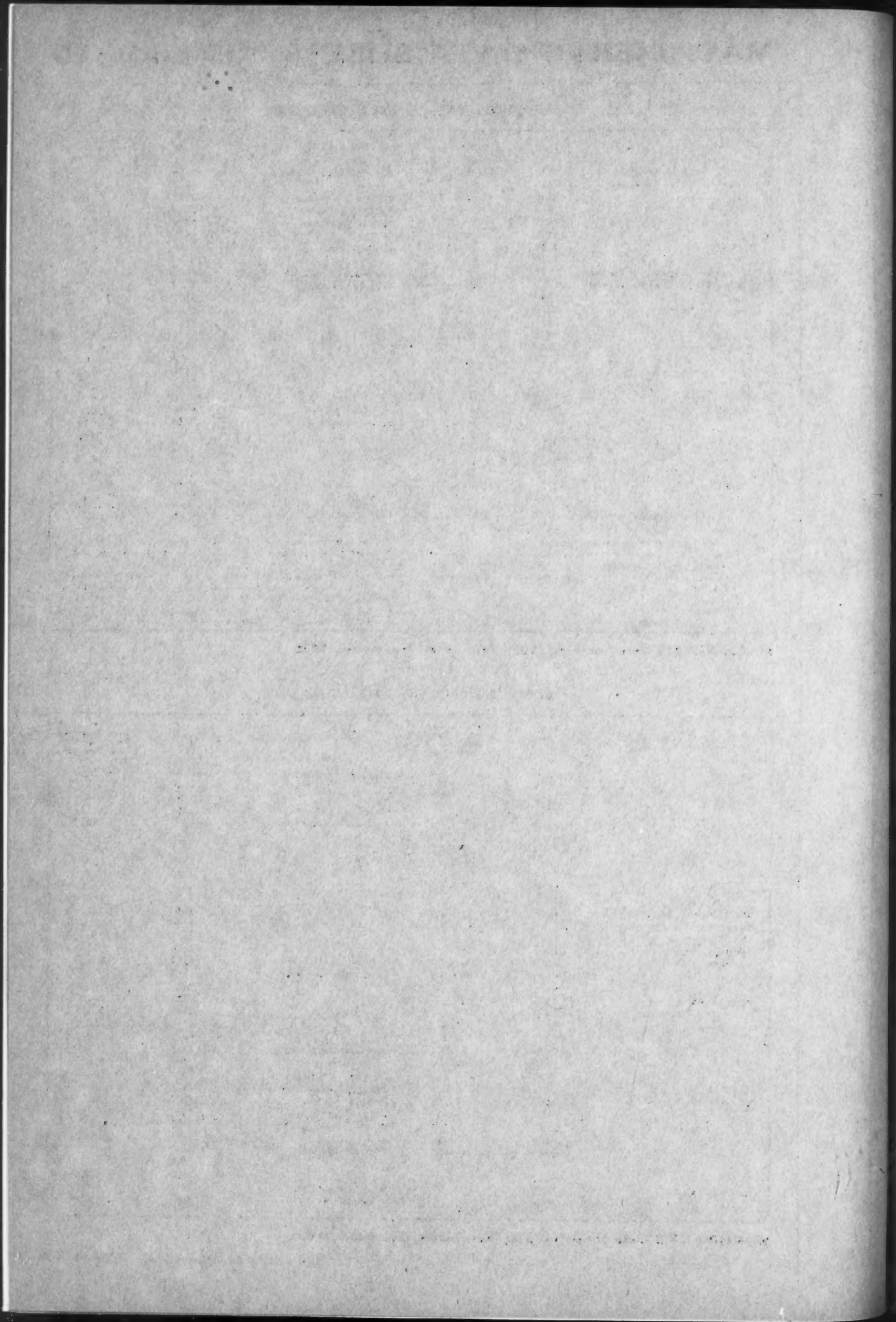
MACHINERY'S Data Sheet No. 309, New Series, November, 1935

APPLICATIONS OF SAE STEELS—4

Product or Application	Steels Used, SAE No.	Heat-Treatment (See Numbered Footnotes on Data Sheet 309)	Product or Application	Steels Used, SAE No.	Heat-Treatment (See Numbered Footnotes on Data Sheet 309)
Shafts	4340	10, 6, 5	Steering knuckles	X3140	6, 10, 5
	4615	12, 2, 3, 5, 13		4130	9, 6
	4620	12, 2, 3, 5, 13		X4130	9, 6
	4640	10, 7, 6, 5	Strip (stainless)	51210	6, 5
	5150	10, 6, 5	Studs and bolts	1025	6, 4, 8, 7
	6115	12, 2, 5, 3, 13, 7		1040	6, 4, 5, 8
	6120	12, 2, 5, 3, 13, 7		1112	7, 4, 5
	6145	10, 6, 5		2330	6, 9
	6150	10, 6, 5		2335	6, 9
	51210	6, 5		3125	6, 11
	51335	6, 5		3130	6, 11
Shift forks and rails.....	1030	6, 4, 8, 7, 5		3135	6, 11, 5
Snaprings	X1055	9, 6, 5		3140	6, 11, 5
	1060	9, 6, 5		4815	10, 2, 5, 3, 13
Springs, clutch	1060	9, 6, 5		4820	10, 2, 5, 3, 13
Springs, coil	5150	10, 6, 5		6135	10, 6, 5
	6145	10, 6, 5	Transmission gears	3115	12, 2, 3, 13, 7
	6150	10, 6, 5		3120	12, 2, 3, 13, 7
Spring wire, coil	1055	9, 6, 4, 5		3312	12, 2, 3, 13, 5
	X1055	9, 6, 5		3415	12, 2, 5, 3, 13, 1
	1060	9, 6, 5		6115	12, 2, 5, 3, 13, 7
	1065	9, 6, 5		6120	12, 2, 5, 3, 13, 7
	X1065	9, 6, 5	Transmission shafts	4140	10, 6, 5
	1080	10, 6, 5		4345	10, 6, 5
	1090	10, 6, 4, 5	Tubing, seamless	1030	6, 8, 4, 7, 5
	1095	10, 6, 4, 5	Tubing (stainless)	51210	6, 5
Springs, leaf	1085	10, 6, 5	Tubing, welded	1020	1, 2, 3, 4, 5, 13, 7
	1090	10, 6, 4, 5	Valves (stainless)	51335	6, 5
	1095	10, 6, 4, 5	Washers (lock, thrust, etc.)	X1055	9, 6, 5
	6145	10, 6, 5		1060	9, 6, 5
	6150	10, 6, 5	Wire, cold-heading	1010	—
	9255	6, 5		1015	—
	9260	6, 5		1035	6, 4, 5, 8
Springs, valve	1060	9, 6, 5	Wire (stainless)	51210	6, 5
	1065	9, 6, 5	Wire, music	1085	10, 6, 5

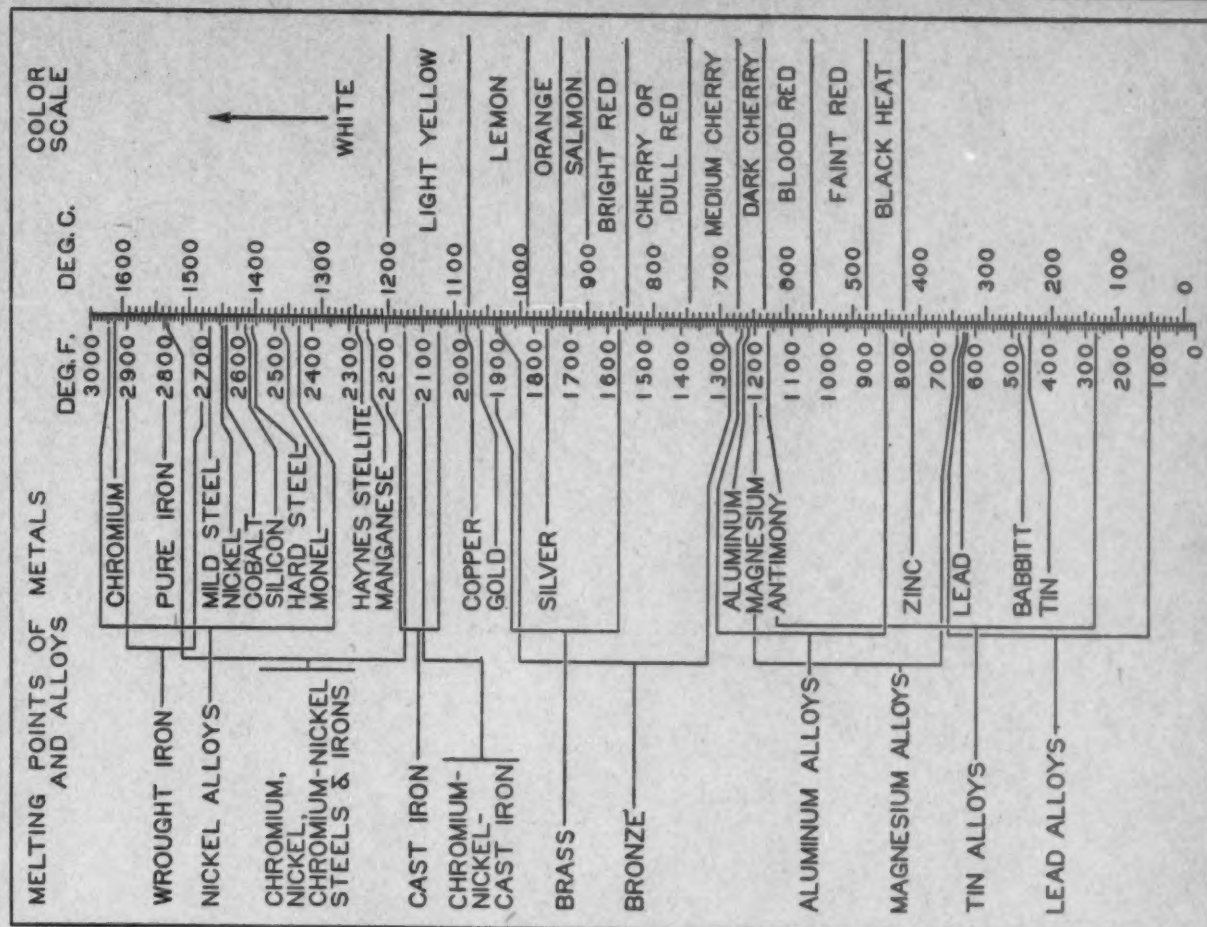
MACHINERY'S Data Sheet No. 310, New Series, November, 1935

MACHINERY, November, 1935—176-A



MACHINERY'S DATA SHEETS 311 and 312

MELTING POINTS AND COLOR SCALE OF METALS AND ALLOYS



MACHINERY'S Data Sheet No. 311, New Series, December, 1935

Compiled by The Linde Air Products Co., New York City

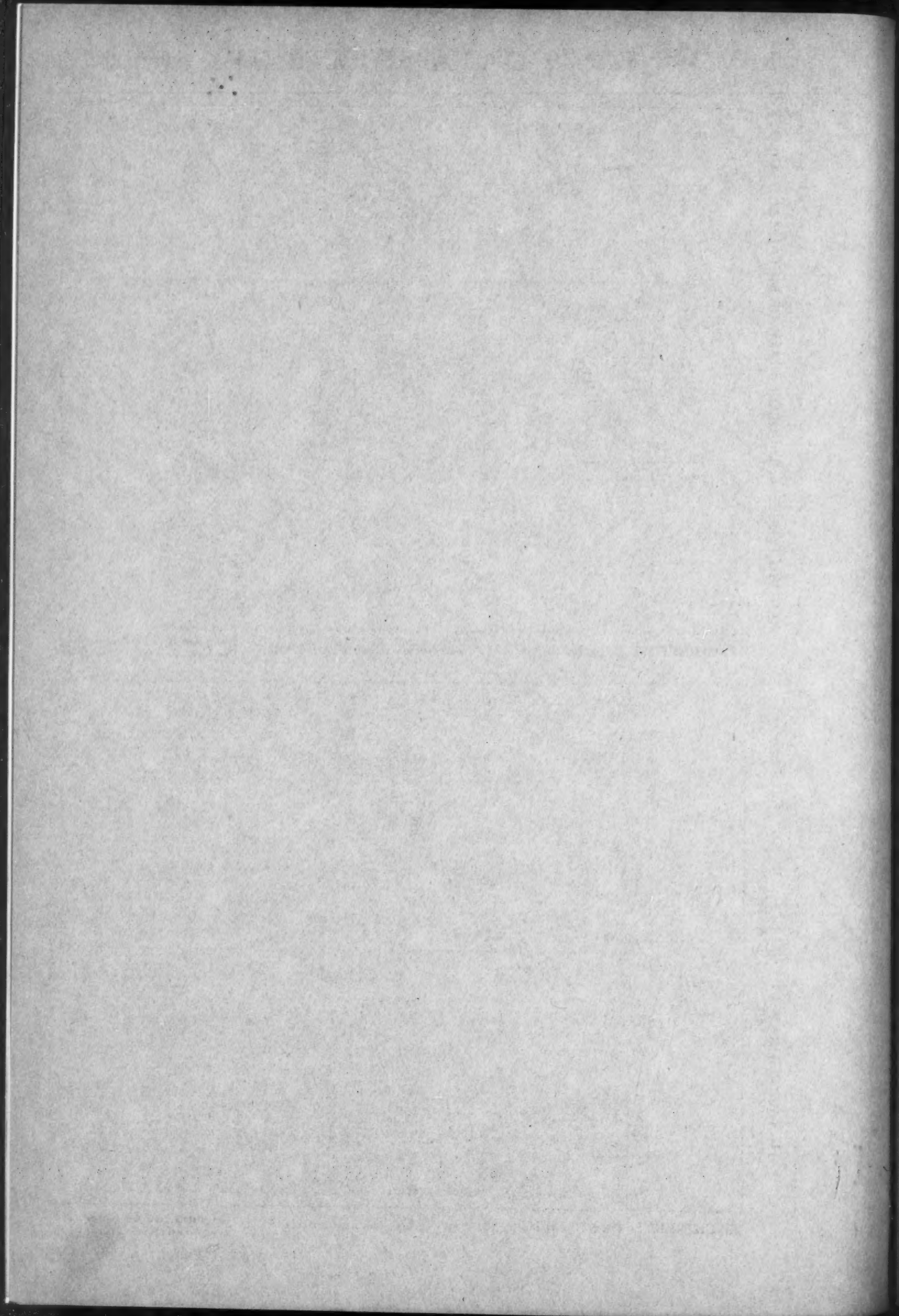
HARDINGE DRAW-IN COLLETS FOR LATHES AND MILLING MACHINES

Make of Machine	Hardinge Collet No.	Maximum Capacity			Principal Dimensions		
		Round	Square	Hexagon	Body A	Thread B	Length C
Ames 5/8" Capacity ...	3A	5/8	7/16	17/32	0.750	0.745-24	3 3/16
Ames 1" Capacity ...	1A	1	23/32	7/8	1.125	1.120-24	3 29/32
Becker No. 1 ...	1B	5/16	7/32	17/64	0.437	0.312-30	1 3/4
Becker No. 2 ...	2B	7/16	5/16	3/8	0.590	0.437-26	2 1/32
Becker No. 2A ...	2AB	9/16	25/64	31/64	0.750	0.500-20	2 9/16
Becker No. 3 ...	3B	3/4	17/32	21/32	0.875	0.625-16	3 7/16
Catacract No. 1 ...	1C	1/4	11/64	13/64	0.335	0.325-40	1 7/16
Catacract No. 2 ...	2C	3/8	17/64	21/64	0.450	0.445-30	1 13/16
Catacract No. 3 ...	3C	1/2	11/32	7/16	0.650	0.645-26	2 11/16
Catacract No. 4 ...	4C	3/4	17/32	21/32	0.950	0.945-20	3
Catacract No. 5 ...	5C	1	23/32	7/8	1.250	1.245-20	3 9/32
Catacract No. 6 ...	6C	1 3/8	31/32	1 3/16	1.625	1.620-18	4 3/8
Hendey No. 2 ...	2H	5/8	7/16	17/32	0.826	0.812-20	4 1/4
Hendey No. 3 ...	3H	7/8	5/8	3/4	1.125	1.062-20	4 7/16
Hendey No. 6 ...	6H	1 1/8	51/64	31/32	1.375	1.312-20	4 3/4
Hendey No. 8 ...	8H	1 1/4	7/8	1 1/16	1.500	1.437-20	4 3/4
Hendey No. 15 ...	15H	1 3/4	1 7/32	1 1/2	2.030	2.000-18*	4 3/4
LeBlond No. 2 ...	2L	3/4	17/32	21/32	0.950	0.945-20	3
LeBlond No. 6 ...	6L	1	23/32	7/8	1.250	1.187-20	4 7/16
Pratt & Whitney No. 30S	30S	2/8	17/64	21/64	0.600	0.500-24	2 1/16
Pratt & Whitney No. 3NS	3PN	1/2	11/32	7/16	0.650	0.645-24	2 1/16
Pratt & Whitney No. 5	5P	5/8	7/16	17/32	0.812	0.807-24	3 11/16
Pratt & Whitney No. 7	7P	7/8	5/8	3/4	1.125	1.120-20	4 3/4
Pratt & Whitney No. 10	10P	1 1/4	7/8	1 1/16	1.500	1.495-20	4 3/4
Rivett No. 30S ...	30S	3/8	17/64	21/64	0.590	0.525-26	2 3/32
Rivett No. 3NS ...	3NS	1/2	11/32	7/16	0.687	0.550-20	2 7/8
Rivett No. 40S ...	40S	1/2	11/32	7/16	0.750	0.670-30	2 25/32
Rivett No. 4NS ...	4NS	5/8	7/16	17/32	0.826	0.812-20	3 1/2
Rivett No. 50S ...	50S	3/4	17/32	21/32	1.062	0.950-18	3 13/32
Rivett No. 5NS ...	5NS	7/8	5/8	3/4	1.062	1.050-20	4 7/32
Seneca No. 2 ...	2S	9/16	25/64	31/64	0.750	0.745-18	3 15/64
Seneca No. 3 ...	3S	3/4	17/32	21/32	1.000	0.995-20	4 19/32
Sloan & Chace No. 5 ...	5SC	3/8	17/64	21/64	0.600	0.500-26	2 7/16
Sloan & Chace No. 5 1/2	52SC	5/8	7/16	17/32	0.800	0.795-20	3 11/16
South Bend 8-9" ...	3SB	1/2	11/32	7/16	0.650	0.645-26	2 11/16
Stark No. 3 ...	3SS	3/8	17/64	21/64	0.590	0.520-26	2 1/8
Stark No. 3 1/2 ...	32S	1/2	11/32	7/16	0.703	0.698-24	2 9/16
Stark No. 4 ...	4S	3/4	17/32	21/32	0.998	0.993-20	3 1/4
Van Norman No. 5 ...	5V	5/8	7/16	17/32	0.850	0.772-18	3 7/8
Van Norman No. 5 1/2	52V	3/4	17/32	21/32	1.000	0.985-18	3 7/16
Wade American No. 5 ...	5WA	3/4	17/32	21/32	0.970	0.965-20	3 3/8
Wade American No. 8 ...	8WN	1	23/32	7/8	1.250	1.245-16	3 29/32

*This collet has a left-hand thread

MACHINERY'S Data Sheet No. 312, New Series, December, 1935

Contributed by Hardinge Brothers, Inc., Elmira, N. Y.



MACHINERY'S DATA SHEETS 313 and 314

HARDINGE DRAW-IN COLLETS USED ON DIFFERENT MAKES OF LATHES AND MILLING MACHINES—1

See Data Sheet No. 312 for maximum capacities and principal dimensions of collets		
Make of Machine	Hardinge Collet No.	Hardinge Collet No.
American 12", 14" and 16" Lathes...	3H	Fay & Scott 14", 16", 18", 20" Lathes 5NS
American 18", 20" and 24" Lathes...	6H	Flather FMC-7" Lathe.....3C
Ames 5/8" Capacity Bench Lathe...	3A	Flather 13" .....4OS
Ames 1" Capacity Bench Lathe.....1A		Flather 14" and 16" Cone-head Lathes .....4NS
Ames 5/8" Capacity Bench Miller.....3A		Flather 18" and 20" Cone-head Lathes .....5NS
Ames 1" Capacity Bench Miller.....1A		Flather 14", 16" and 20" Geared-head Lathes .....5NS
Becker No. 1 Vertical Miller.....1B		Greaves-Klusman 16" and 18" Lathes 3H
Becker No. 2 Vertical Miller.....2B		Hamilton 14", 16" and 18" Lathes...5C
Becker No. 2A Vertical Miller.....2AB		Hardinge Bench Lathes and Millers (See Cataract)
Becker No. 3 Vertical Miller.....3B		Hendey 12" Cone Lathe.....2H
Boye & Emmes 14", 16" and 18" Lathes .....6H		Hendey 12" Geared Lathe...2H or 3H
Boye & Emmes 20" and 24" Lathes...6C		Hendey 14" Cone or Geared Lathes .....2H or 3H
Burke No. 0, 1, 2, 3, 4 and 5 Milling Machines .....3C		Hendey 16" Cone or Geared Lathes .....3H or 6H
Carroll & Jamieson 13", 14" and 16" Lathes .....3H		Hendey 18", 20" and 24" Cone or Geared Lathes .....6H or 8H
Carter & Hakes Milling Machine...4OS		Hendey Centering Machine.....3H
Cataract No. 3 Bench Lathe (1/2" Capacity) .....3C		Johnston 9 1/2" Lathe.....3C
Cataract No. 4 Bench Lathe (3/4" Capacity) .....4C		LeBlond (Regal) 10" Lathe.....3C
Cataract No. 5 Bench Lathe (1" Capacity) .....5C		LeBlond (Regal) 12" and 14" Lathes .....4NS
Cataract No. 3 Bench Miller.....3C		LeBlond (Regal) 16" and 18" Lathes 6L
Cataract No. 4 Bench Miller.....4C		LeBlond 12", 14", 16" and 17" Lathes 2L
Cataract No. 5 Bench Miller.....5C		LeBlond No. 3-14", 16", 17" and 18" Lathes .....3H
Cataract 9" Quick-change Back-gear Lathe .....5C		LeBlond No. 6-16", 17", 18", 19" and 20" Lathes.....6L
Chard 16", 18" and 20" Lathes.....6H		Lehmann 16" and 18" Lathes.....5NS
Chard 24" and 28" Lathes.....8H		Monarch 9", 10", 11" and 12" O. S. Lathes .....2H
Cincinnati 14" and 16" Lathes...3H		Monarch 14" and 16" Lathes.....3H
Cincinnati 18" and 20" Lathes...6H		Monarch 18" and 20" Lathes.....6H
Cisco 14" Lathe .....3H		Mueller 18" Lathe.....6H
Cisco 16", 18" and 20" Lathes...3H		Porter-Cable 9" Production Lathe...2H
Cushman 16", 18" and 20" Lathes...3H		Porter-Cable 12" Carbo-Lathe.....5C
Cushman Collet Chuck for Engine Lathes .....15H		Porter-Cable (Mulliner) 12" and 14" Lathes .....2H
Dalton B-4 Lathe .....3C		Potter No. 3 Bench Lathe.....3C
Dalton B-6 Lathe .....3C or 4C		
Davis 12" and 14" Lathes.....2H		
Davis 16" Lathe .....3H		
Davis 18" and 20" Lathes.....6H		
Elgin 3/4" Capacity Bench Lathe...4C		

This sheet and Data Sheets Nos. 312 and 314 can be used to identify standard stock collets or to determine collet sizes for different types and makes of lathes and milling machines.

This sheet and Data Sheets Nos. 312 and 314 can be used to identify standard stock collets or to determine collet sizes for different types and makes of lathes and milling machines.

MACHINERY'S Data Sheet No. 313, New Series, January, 1936

Contributed by Hardinge Brothers, Inc., Elmira, N. Y.

HARDINGE DRAW-IN COLLETS USED ON DIFFERENT MAKES OF LATHES AND MILLING MACHINES—2

See Data Sheet No. 312 for maximum capacities and principal dimensions of collets

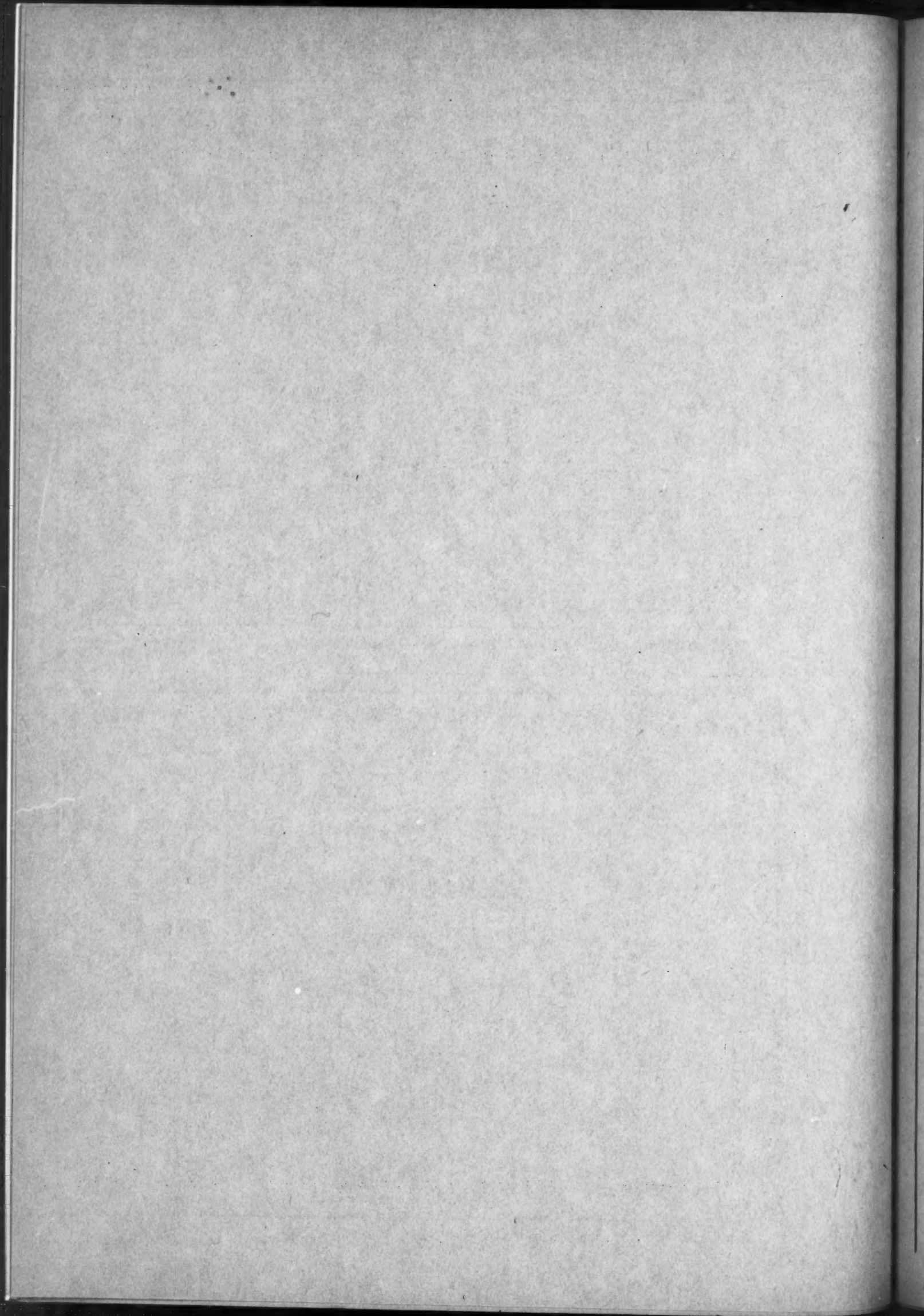
Make of Machine	Hardinge Collet No.	Make of Machine	Hardinge Collet No.
Potter No. 4 Bench Lathe.....	4C	Sidney Standard Pattern Lathes:	
Pratt & Whitney Bench Lathe 3PO or 3PN		12" Cone or Geared.....	2H
Pratt & Whitney 10" Tool-room Lathe.....	5P	14" and 16" Cone or Geared.....	3H
Pratt & Whitney 13" and 14" Lathes 7P		18" and 20".....	6H
Pratt & Whitney 16" and 16-20" Lathes	10P	25", 27", 30" and 36".....	15H
Rahn-Larmon 16" and 18" Lathes—Series "LN".....	3H	Sidney Monotrol and Tritrol Lathes:	
Rahn-Larmon 18" and 20" Lathes—Series "AA".....	8H	12", 14", 16" and 18".....	6H
Rahn-Larmon 20" and 24" Lathes—Series "B" and "D".....	8H	18" and 20" (Heavy Pattern).....	8H
Reed Prentice 18" and 20" Lathes..6L		24", 30" and 36".....	15H
Reed Prentice Heavy-duty Lathes.15H		Sloan & Chace No. 5 Bench Lathe.5SC	
Rivett No. 3 Bench Lathe.....	3OS	Sloan & Chace No. 5 1/2 Bench Lathe.....	52SC
Rivett No. 3 N.S. Bench Lathe.....	3NS	Lathe	
Rivett No. 4 Bench Lathe.....	4OS	South Bend 8" and 9" Lathes.....	3SB
Rivett No. 504-4 N.S. Bench Lathe.4NS		South Bend 11" Lathe.....	28
Rivett No. 608 Bench Lathe.....	4NS	South Bend 13" Lathe.....	4NS
Rivett No. 5 Bench Lathe.....	5OS	South Bend 15" Lathe.....	4C
Rivett No. 506-606-706-5 N.S. Bench Lathes	5NS	South Bend 16" Lathe.....	5NS
Rivett No. 507 Bench Lathe.....	4S	South Bend 18" Lathe.....	6H
Rockford (Sundstrand) 9", 15" and 16" Lathes	3H	South Bend 21" Lathe.....	6C
Rockford (Economy) 12" Lathe...3H		South Bend 24" Lathe.....	6C
Rockford (Economy) 14" and 16" Lathes	8H	Springfield 14" Lathe.....	2H or 6H
Rockford (Economy) 22" Lathe...3H		Springfield 16" Lathe.....	3H or 6H
Schaffner 11" Lathe (Model "A")..2H		Springfield 18" and 20" Lathes....6H	
Sebastian 11" Lathe (Old Model)..2S		Springfield 24" and 26" Lathes....8H	
Sebastian (Viking) 12", 14", 16" and 18" Lathes.....	3H	Stark No. 3 Bench Lathe.....	3SS
Sebastian (Viking) 20" Lathe....6H		Stark No. 3 1/2 Bench Lathe.....	32S
Sebastian (Gold Seal) 12", 14" and 16" Lathes	3H	Stark No. 4 Bench Lathe.....	4S
Sebastian (Gold Seal) 18" and 20" Lathes	6H	Stark Miller	4S
Seneca or Star 10" and 12" Lathes.2S		Van Norman No. 5 Bench Lathe...5V	
Seneca or Star 14" Lathe.....3S		Van Norman No. 5 1/2 Bench Lathe.....	52V
Shepard Lathe	4NS	Van Norman Millers	5V
Shepard Lathe	2H	Wade American 3/4" Capacity Bench Lathe	5WA
Shepard Lathe	3H	Bench Lathe	
		Wade American 1" Capacity Bench Lathe	5WN
		Walcott 14" Lathe	2H
		Walcott 16", 18" and 20" Lathes...6H	
		Whitcomb Blaisdell 14" Lathe.....4C	
		Whitcomb Blaisdell 16" and 18" Lathes	3H
		Whitcomb Blaisdell 20" Lathe.....6H	
		Willard 13" Lathe.....	3H
		Worcester 12" Lathe.....	2H
		Worcester 14" Lathe.....	3H

This sheet and Data Sheets Nos. 312 and 313 may be used to identify standard stock collets or to determine collet sizes for different types and makes of lathes and milling machines.

This sheet and Data Sheets Nos. 312 and 313 may be used to identify standard stock collets or to determine collet sizes for different types and makes of lathes and milling machines.

MACHINERY'S Data Sheet No. 314, New Series, January, 1936

Contributed by Hardinge Brothers, Inc., Elmira, N. Y.



MACHINERY'S DATA SHEETS 315 and 316

REBUILDING WORN PARTS BY THE OXY-ACETYLENE PROCESS—1

	Operation	Purpose Behind Use of Operation	Metals to which Operation is Applied	Type of Surface Resulting	Preheat and Anneal
1	Bronze-surfacing with a rod such as the new wear-resisting bronze rod.*	For building up worn surfaces. Low melting point rod of special composition for ease of application and easy machining. For wearing surfaces in lubricated places or non-lubricated places where low heat conditions prevail.	Cast iron, semi-steel, carbon steels, alloy steels, malleable iron, wrought iron, copper-base alloys, Monel metal, nickel.	Surface of excellent wear-resisting qualities, which can be easily machined to close tolerance.	Normally not necessary. Only used on castings to prevent heat effect of flame, such as warping or cracking when large surface is to be rebuilt.
2	Resurfacing with rod of same or very similar composition as base metal, such as High Test steel welding rod.†	To restore part to original condition and size.	All metals ordinarily fusion-welded, and heat-treated alloys that can be given subsequent heat-treatment to restore original physical properties.	Can be machined with same facility as base metal.	Usually unnecessary. May be advisable to counteract heat effects when building up large surface area.
3	Resurfacing with rod similar to but not same as base metal, such as an alloy steel rod with air-hardening properties.	To restore a worn part to original size and give a deposit that may be subsequently forged, heat-treated, or left as welded in a condition superior to original in hardness and toughness.	Carbon steels, wrought iron, low alloy steels. Note: Should not be applied to heat-treated steels except in special cases.	Usually not easily machined, but can be easily ground, forged, or heat-treated.	Generally unnecessary on carbon steels and wrought iron. A blow-pipe treatment advisable where base metal depends on heat-treatment for its properties.

*Oxweld No. 25 M Patented Bronze Rod. †Oxweld No. 1 HT (High Test) Patented Steel Rod.

MACHINERY'S Data Sheet No. 315, New Series, February, 1936 Compiled by The Linde Air Products Co.

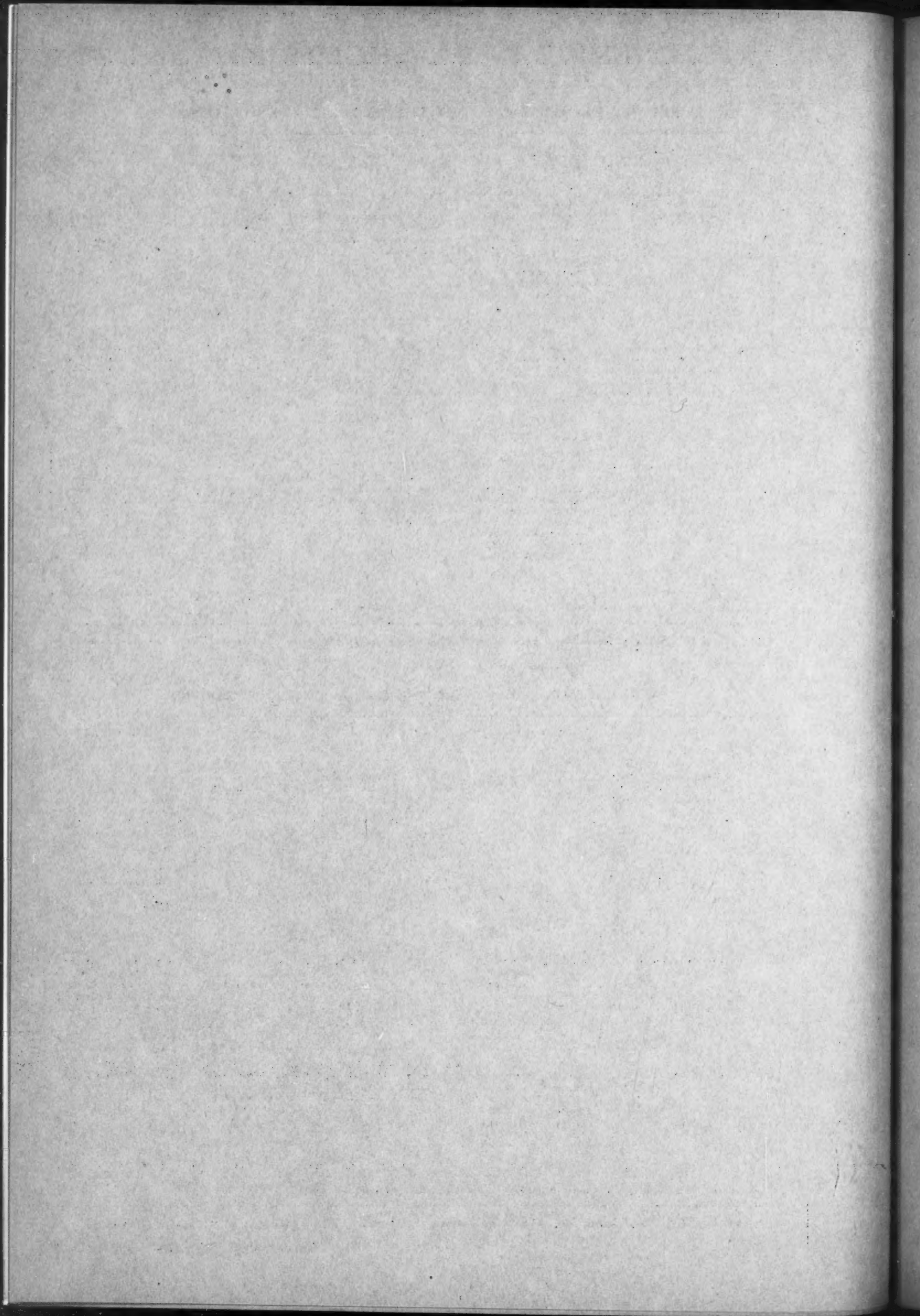
REBUILDING WORN PARTS BY THE OXY-ACETYLENE PROCESS—2

	Operation	Flame Adjustment	Heat Control	Other Essential Technique Points	Typical Examples
1	Bronze-surfacing with a rod such as the new wear-resisting bronze rod.*	Slightly oxidizing.	Base metal should be heated by flame only to the point where molten fluxed rod flows over the base metal like water over a wet surface, i.e., a "sweating" heat.	A flux prepared specially for bronze-welding should be plentifully used.	Pistons, sliding valves, seal rings, and other wearing reciprocating parts used dry at low temperatures or hot and well lubricated. Other typical parts: Rocker arm rollers, lever bearings, gear teeth, shafts, spindles, yokes, pins, and clevises.
2	Resurfacing with rod of same or very similar composition as base metal, such as High Test steel welding rod.†	Same as fusion-welding adjustment for particular base metal under consideration.	Same as for joining two parts. Do not overheat.	Follow welding technique used for joining the material.	Many badly worn parts are rebuilt with rod of same composition preparatory to hard-surfacing. This for economy's sake.
3	Resurfacing with rod similar to but not same as base metal, such as an alloy steel rod with air-hardening properties.	Neutral, unless it is desired to spot harden by increasing carbon content of the deposit, in which case more or less reducing adjustment should be used.	Same as for joining two parts by fusion welding. Do not overheat.	No flux used except on certain chromium steels where Chrom-alloy flux is essential to success.	Rail ends, dies, rolls, anvils, etc.

*Oxweld No. 25 M Patented Bronze Rod. †Oxweld No. 1 HT (High Test) Patented Steel Rod.

MACHINERY'S Data Sheet No. 316, New Series, February, 1936 Compiled by The Linde Air Products Co.

MACHINERY, February, 1936—368-A



MACHINERY'S DATA SHEETS 317 and 318

REBUILDING WORN PARTS BY THE OXY-ACETYLENE PROCESS—3

	Operation	Purpose Behind Use of Operation	Metals to which Operation is Applied	Type of Surface Resulting	Preheat and Anneal
4	Hard-surfacing with iron-base wear-resistant alloys (chromium-manganese-iron).*	For parts subjected to moderate abrasive wear or severe impact. Have greater hardness and wear resistance than (3)† and are often used as filling or base materials under the more wear-resistant non-ferrous alloys (5) and (6). ‡See Data Sheet No. 315, February, 1936.	Carbon steels; low alloy steels, though in some cases heat-treatment after application may be necessary. Alloy and semi-steel castings; gray cast iron.	Can be ground to close tolerance. Can be forged or heat-treated if necessary.	Ordinarily unnecessary for carbon steels, unless large area is to be covered. Pre-heat and anneal advisable for castings and essential on alloy steels. When necessary, quench in oil—not water.
5	Hard-surfacing with non-ferrous wear-resistant alloys (cobalt-chromium-tungsten).†	For resistance to severe abrasion and especially for resistance to abrasion at elevated temperatures, as the hardness of these alloys is retained at a red heat.	Same as (4). Also Monel metal and high chromium (stainless) steels.	Grinding finish to very close tolerance. No forging possible and unaffected by heat-treatment. Cannot be machined.	Ordinarily unnecessary for carbon steels up to 0.60 per cent carbon or for Monel metal. Preheat and anneal advisable for castings and certain high-chromium steels. When necessary, quench in oil—not water.
6	Hard-setting and hard-surfacing with diamond substitutes (inserts of tungsten carbide)‡ or a composite rod consisting of crushed particles of tungsten carbide in a bonding material.§	For parts subjected to extremely severe abrasion.	Carbon steels (heat-treatment often necessary). Low alloy steels (heat-treatment often necessary). Alloy, semi-steel, gray iron castings.	Surface used as originally applied.	Usually advisable because most base materials on which diamond substitutes are applied have been hardened.

*Harcrome Welding Rod. †Haynes Stellite. ‡Haystellite Inserts. §Haystellite Composite Rod.

MACHINERY'S Data Sheet No. 317, New Series, March, 1936

Compiled by The Linde Air Products Co.

REBUILDING WORN PARTS BY THE OXY-ACETYLENE PROCESS—4

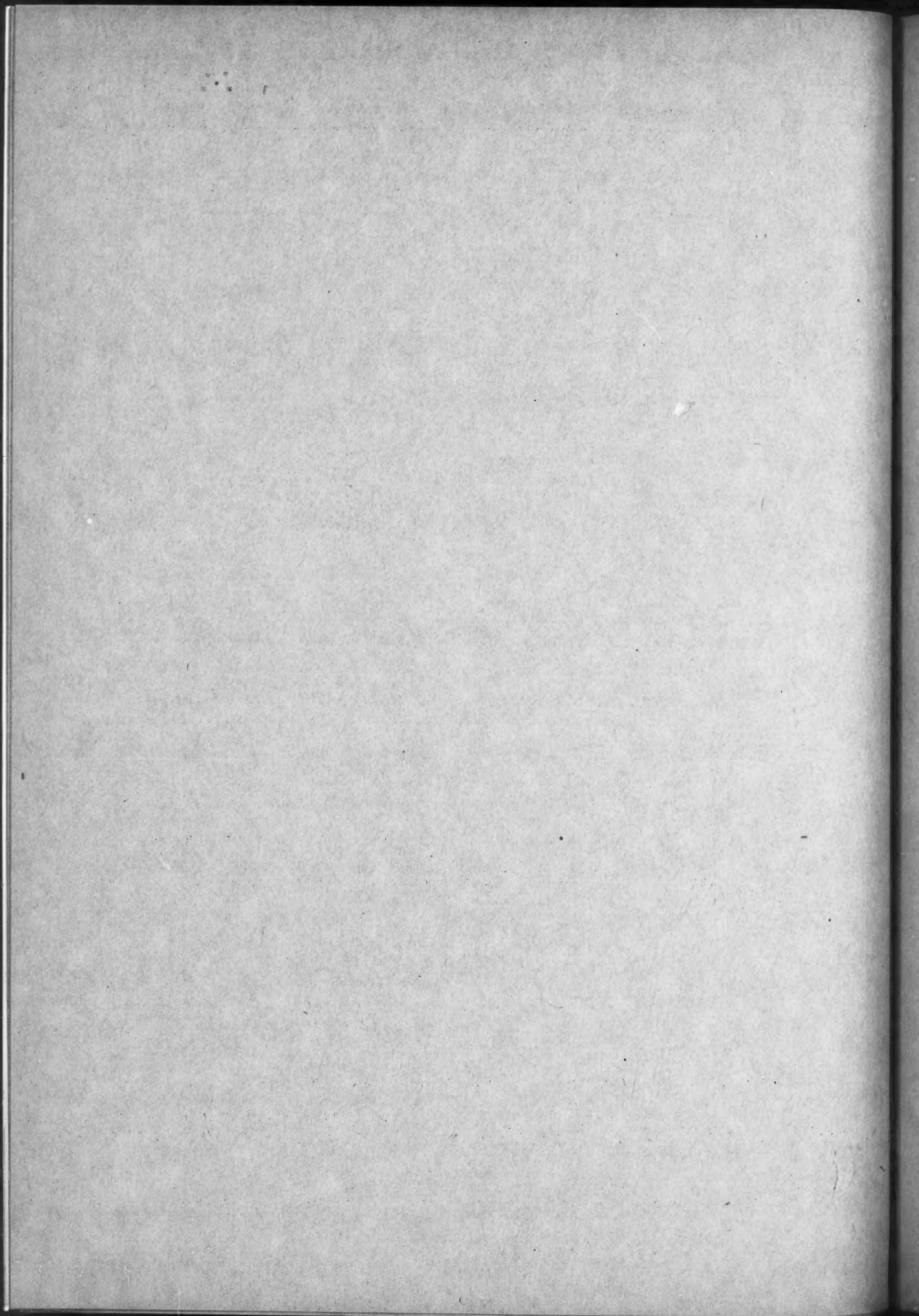
	Operation	Flame Adjustment	Heat Control	Other Essential Technique Points	Typical Examples
4	Hard-surfacing with iron-base wear-resistant alloys (chromium-manganese-iron).*	A very slightly reducing flame. Do not use a neutral flame adjustment. The hardness of the deposit is affected by the amount of excess acetylene.	Heat base metal to "sweating" temperature so rod flows over heated area. Do not mix base metal and rod in a molten puddle. Slight puddling is necessary on cast iron.	A good flux may facilitate the work on cast materials, but is unnecessary otherwise.	Gyratory crusher mantles, crusher jaws, dipper teeth, etc.
5	Hard-surfacing with non-ferrous wear-resistant alloys (cobalt-chromium-tungsten).†	Excess acetylene (carbonizing) flame. Acetylene feather double the length of inner cone. On cast iron use a little less excess.	Heat base metal to "sweating" temperature so rod flows over small heated areas. Do not mix base metal and rod in a molten puddle. Cast iron requires very slight puddling.	Flux unnecessary, though may facilitate work on cast iron. Base metal should be cleaned of dirt and scale.	Steam valves and valve seats, gasoline and Diesel engine valves and exhaust valve seats, dies, plow shares, hot shearing knives, coke pusher shoes, grizzlies, and many other parts subjected to severe abrasion or to heat and abrasion.
6	Hard-setting and hard-surfacing with diamond substitutes (inserts of tungsten carbide)‡ or a composite rod consisting of crushed particles of tungsten carbide in a bonding material.§	Very slightly reducing.	As the bonding agent is usually one of the aforementioned materials (2)¶ (3)¶ (4) (5), use same technique and heat control. It is important to keep heat always at a minimum. ‡See Data Sheet No. 316, February, 1936.	No flux necessary or advisable. Inserts should be one-third submerged in base metal and then entirely covered with bonding material.	Oil-well drilling tools, coal undercutter bits, dredge cutters, air-plane tail skids, etc.

*Harcrome Welding Rod. †Haynes Stellite. ‡Haystellite Inserts. §Haystellite Composite Rod.

MACHINERY'S Data Sheet No. 318, New Series, March, 1936

Compiled by The Linde Air Products Co.

MACHINERY, March, 1936—432-A



MACHINERY'S DATA SHEETS 319 and 320

CHEMICAL COMPOSITION OF S A E STEELS—1

Carbon Steels*				Manganese Steels*			
S A E No.	Carbon	Manganese		S A E No.	Carbon	Manganese	
1010	0.05-0.15	0.30-0.60		T1330	0.25-0.35	1.60-1.90	
1015	0.10-0.20	0.30-0.60		T1335	0.30-0.40	1.60-1.90	
X1015	0.10-0.20	0.70-1.00		T1340	0.35-0.45	1.60-1.90	
1020	0.15-0.25	0.30-0.60		T1345	0.40-0.50	1.60-1.90	
X1020	0.15-0.25	0.70-1.00		T1350	0.45-0.55	1.60-1.90	
1025	0.20-0.30	0.30-0.60					
X1025	0.20-0.30	0.70-1.00		Nickel Steels†			
1030	0.25-0.35	0.60-0.90					
1035	0.30-0.40	0.60-0.90		S A E No.	Carbon	Manganese	Nickel
1040	0.35-0.45	0.60-0.90		2015	0.10-0.20	0.30-0.60	0.40-0.60
X1040	0.35-0.45	0.40-0.70		2115	0.10-0.20	0.30-0.60	1.25-1.75
1045	0.40-0.50	0.60-0.90		2315	0.10-0.20	0.30-0.60	3.25-3.75
X1045	0.40-0.50	0.40-0.70		2320	0.15-0.25	0.30-0.60	3.25-3.75
1050	0.45-0.55	0.60-0.90		2330	0.25-0.35	0.50-0.80	3.25-3.75
X1050	0.45-0.55	0.40-0.70		2335	0.30-0.40	0.50-0.80	3.25-3.75
1055	0.50-0.60	0.60-0.90		2340	0.35-0.45	0.60-0.90	3.25-3.75
X1055	0.50-0.60	0.90-1.20		2345	0.40-0.50	0.60-0.90	3.25-3.75
1060	0.55-0.70	0.60-0.90		2350	0.45-0.55	0.60-0.90	3.25-3.75
1065	0.60-0.75	0.60-0.90		2515	0.10-0.20	0.30-0.60	4.75-5.75
X1065	0.60-0.75	0.90-1.20					
1070	0.65-0.80	0.60-0.90		Nickel-Chromium Steels†			
1075	0.70-0.85	0.60-0.90					
1080	0.75-0.90	0.60-0.90		S A E No.	Carbon	Manganese	Nickel
1085	0.80-0.95	0.60-0.90		3115	0.10-0.20	0.30-0.60	1.00-1.50
1090	0.85-1.00	0.60-0.90		3120	0.15-0.25	0.30-0.60	1.00-1.50
1095	0.90-1.05	0.25-0.50		3125	0.20-0.30	0.50-0.80	1.00-1.50
				3130	0.25-0.35	0.50-0.80	1.00-1.50
				3135	0.30-0.40	0.50-0.80	1.00-1.50
				3140	0.35-0.45	0.60-0.90	1.00-1.50
				X3140	0.35-0.45	0.60-0.90	1.00-1.50
				3145	0.40-0.50	0.60-0.90	1.00-1.50
				3150	0.45-0.55	0.60-0.90	1.00-1.50
				3215	0.10-0.20	0.30-0.60	1.50-2.00
				3220	0.15-0.25	0.30-0.60	1.50-2.00
				3230	0.25-0.35	0.30-0.60	1.50-2.00
				3240	0.35-0.45	0.30-0.60	1.50-2.00
				3245	0.40-0.50	0.30-0.60	1.50-2.00
				3250	0.45-0.55	0.30-0.60	1.50-2.00
				3312	max. 0.17	0.30-0.60	3.25-3.75
				3325	0.20-0.30	0.30-0.60	3.25-3.75
				3335	0.30-0.40	0.30-0.60	3.25-3.75
				3340	0.35-0.45	0.30-0.60	3.25-3.75
				3415	0.10-0.20	0.30-0.60	2.75-3.25
				3435	0.30-0.40	0.30-0.60	2.75-3.25
				3450	0.45-0.55	0.30-0.60	2.75-3.25

*Maximum sulphur 0.050 and maximum phosphorus 0.040. The silicon range of basic open-hearth alloy steels shall be 0.15-0.30. For electric and acid open-hearth alloy steels, the silicon content shall be 0.15 minimum.

MACHINERY'S Data Sheet No. 319, New Series, April, 1936

As Revised January, 1935, by the Society of Automotive Engineers

CHEMICAL COMPOSITION OF S A E STEELS—2

Molybdenum Steels*				Tungsten Steels†			
S A E No.	Carbon	Chromium	Nickel	S A E No.	Carbon	Chromium	Tungsten
4130	0.25-0.35	0.50-0.80	.....	71360	0.50-0.70	3.00-4.00	12.00-15.00
X4130	0.25-0.35	0.80-1.10	.....	71660	0.50-0.70	3.00-4.00	15.00-18.00
4135	0.30-0.40	0.80-1.10	.....	7260	0.50-0.70	0.50-1.00	1.50-2.00
4140	0.35-0.45	0.80-1.10	.....			
4150	0.45-0.55	0.80-1.10	.....			
4340	0.35-0.45	0.50-0.80	1.50-2.00				
4345	0.40-0.50	0.50-0.80	1.50-2.00				
4615	0.10-0.20	0.40-0.70	1.65-2.00				
4620	0.15-0.25	0.40-0.70	1.65-2.00				
4640	0.35-0.45	0.50-0.80	3.25-3.75				
4815	0.10-0.20	0.40-0.60	3.25-3.75				
4820	0.15-0.25	0.40-0.60	3.25-3.75				

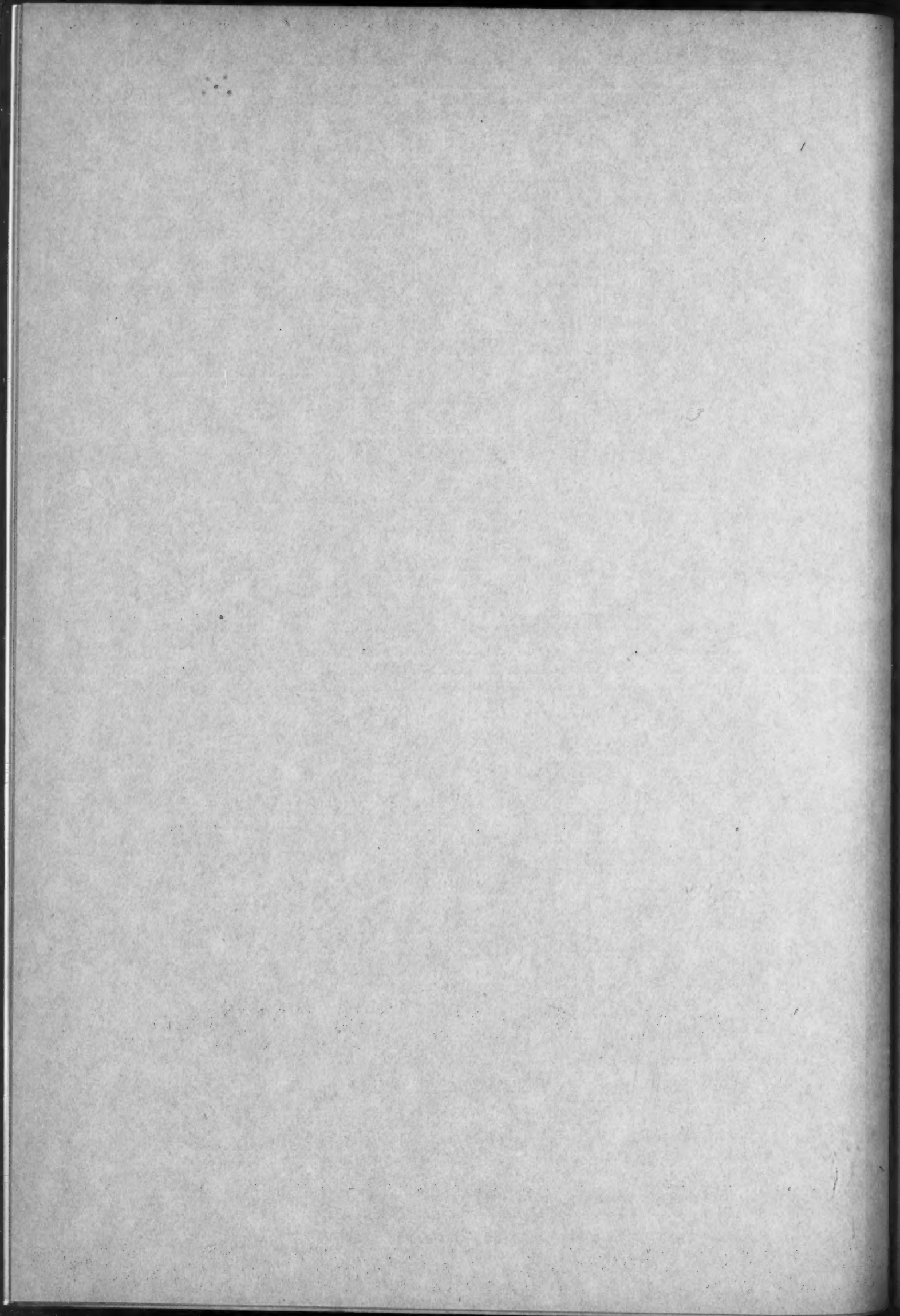
Chromium-Vanadium Steels†				Silicon-Manganese Steels			
S A E No.	Carbon	Chromium	Vanadium	S A E No.	Carbon	Manganese	Silicon
5120	0.15-0.25	0.30-0.60	0.05-0.10	6115	0.10-0.20	0.80-1.10	0.80-1.10
5140	0.35-0.45	0.60-0.90	0.80-1.10	6120	0.15-0.25	0.80-1.10	0.80-1.10
5150	0.45-0.55	0.60-0.90	0.80-1.10	6125	0.20-0.30	0.80-1.10	0.80-1.10
52100	0.95-1.10	0.20-0.50	1.20-1.50	6130	0.25-0.35	0.80-1.10	0.80-1.10
				6135	0.30-0.40	0.80-1.10	0.80-1.10

Corrosion- and Heat-Resisting Alloys			
S A E No.	Carbon, Max.	Phosphorus, Max.	Sulphur, Max.
30905	0.08	0.030	0.030
30915	0.09-0.20	0.030	0.030
51210	0.12	0.030	0.030
X51410	0.13	0.030	0.030
51335	0.25-0.40	0.030	0.030
51510	0.12	0.030	0.030
51710	0.12	0.030	0.030

*Maximum phosphorus 0.040; maximum sulphur 0.050. †Maximum phosphorus 0.040 and maximum sulphur 0.050 for steels 5120, 5140, and 5150. Maximum phosphorus 0.030 and maximum sulphur 0.035 for steel 52100. ‡Maximum manganese 0.30; maximum phosphorus 0.035; and maximum sulphur 0.040. §Minimum vanadium 0.15; desired vanadium, 0.18. Maximum phosphorus 0.040, and maximum sulphur 0.050 for steels 6115 to 6135, inclusive. Maximum phosphorus 0.030, and maximum sulphur 0.035 for steel 6195. The silicon range of basic open-hearth alloy steels shall be 0.15-0.30. For electric and acid open-hearth alloy steels, the silicon content shall be 0.15 minimum. This applies to the molybdenum, chromium, tungsten, and chromium-vanadium steels above.

MACHINERY'S Data Sheet No. 320, New Series, April, 1936

As Revised January, 1935, by the Society of Automotive Engineers



DATA FOR DESIGNING NON-METALLIC GEARS*—1

Preferred Pitch—The pitch of the gear or pinion should bear a reasonable relation to the transmitted horsepower and speed or to the applied torque. Two preferred pitch tables are given. The first is based on the horsepower load at a given pitch line velocity, while the second is based on the applied torque. The latter table gives the pounds torque at a one-foot radius, which for any given horsepower and speed can be obtained from the following formula:

$$T = \frac{5252 \times H.P.}{R.P.M.}$$

Diametral Pitch for Given Horsepower and Pitch Line Velocities

Horsepower Transmitted	Pitch Line Velocity up to 1000 Feet per Minute	Pitch Line Velocity from 1000 to 2000 Feet per Minute	Pitch Line Velocity over 2000 Feet per Minute
1/4-1	8-10	10-12	12-16
1-2	7-8	8-10	10-12
2-3	6-7	7-8	8-10
3-7 1/2	5-6	6-7	7-8
7 1/2-10	4-5	5-6	6-7
10-15	3-4	4-5	5-6
15-25	2 1/2-3	3-4	4-5
25-60	2-2 1/2	2 1/2-3	3-4
60-100	1 3/4-2	2-2 1/2	2 1/2-3
100-150	1 1/2-1 3/4	1 3/4-2	2-2 1/2

Torque in Foot-Pounds for Given Diametral Pitch

Diametral Pitch	Torque in Foot-Pounds		Diametral Pitch	Torque in Foot-Pounds	
	Minimum	Maximum		Minimum	Maximum
16	1	2	4	50	100
12	2	4	3	100	200
10	4	8	2 1/2	200	450
8	8	15	2	450	900
6	15	30	1 1/2	900	1800
5	30	50	1	1800	3500

*These preferred pitch tables are applicable to both the rawhide and phenolic laminated type materials.

MACHINERY'S Data Sheet No. 321, New Series, May, 1936

Recommended Practice of American Gear Manufacturers' Association, 1935

DATA FOR DESIGNING NON-METALLIC GEARS*—2

Bore Sizes

For plain phenolic laminated pinions, that is, pinions without metal end plates, a drive fit of 0.001 inch per inch of shaft diameter should be used. For shafts above 2.5 inches in diameter, the fit should be constant at 0.0025 to 0.003 inch.

When metal reinforcing end plates are used, the drive fit should conform to the same standards as used for metal.

Relation of Bore to Pinion Diameter

The root diameter of a pinion of phenolic laminated type should be such that the minimum distance from the edge of the keyway to the root diameter will be at least equal to the depth of tooth. For rawhide pinions, this point is covered under "Adopted Standard for Rawhide Gears," revision of 1932.

Keyway Stresses

The keyway stress should not exceed 3000 pounds per square inch on a plain phenolic laminated gear or pinion.

The keyway stress is calculated by the formula:

$$S = \frac{32,000 \times H.P.}{PLS \times A}$$

in which

S = unit stress in pounds per square inch;

H.P. = horsepower transmitted;

PLS = peripheral speed of shaft in feet per minute; and

A = square inch area of keyway in pinion. (Length \times Height)

If the keyway stress formula is expressed in terms of shaft radius and revolutions per minute, it will read:

$$S = \frac{63,000 \times H.P.}{R.P.M. \times r \times A}$$

When the design is such that the keyway stresses exceed 3000 pounds, metal reinforcing end plates may be used. Such end plates should not extend beyond the root diameter of the teeth. The distance from the outer edge of the retaining bolt to the root diameter of the teeth shall not be less than a full tooth depth.

The use of drive keys should be avoided, but if required, metal end plates should be used on the pinion to take the wedging action of the key.

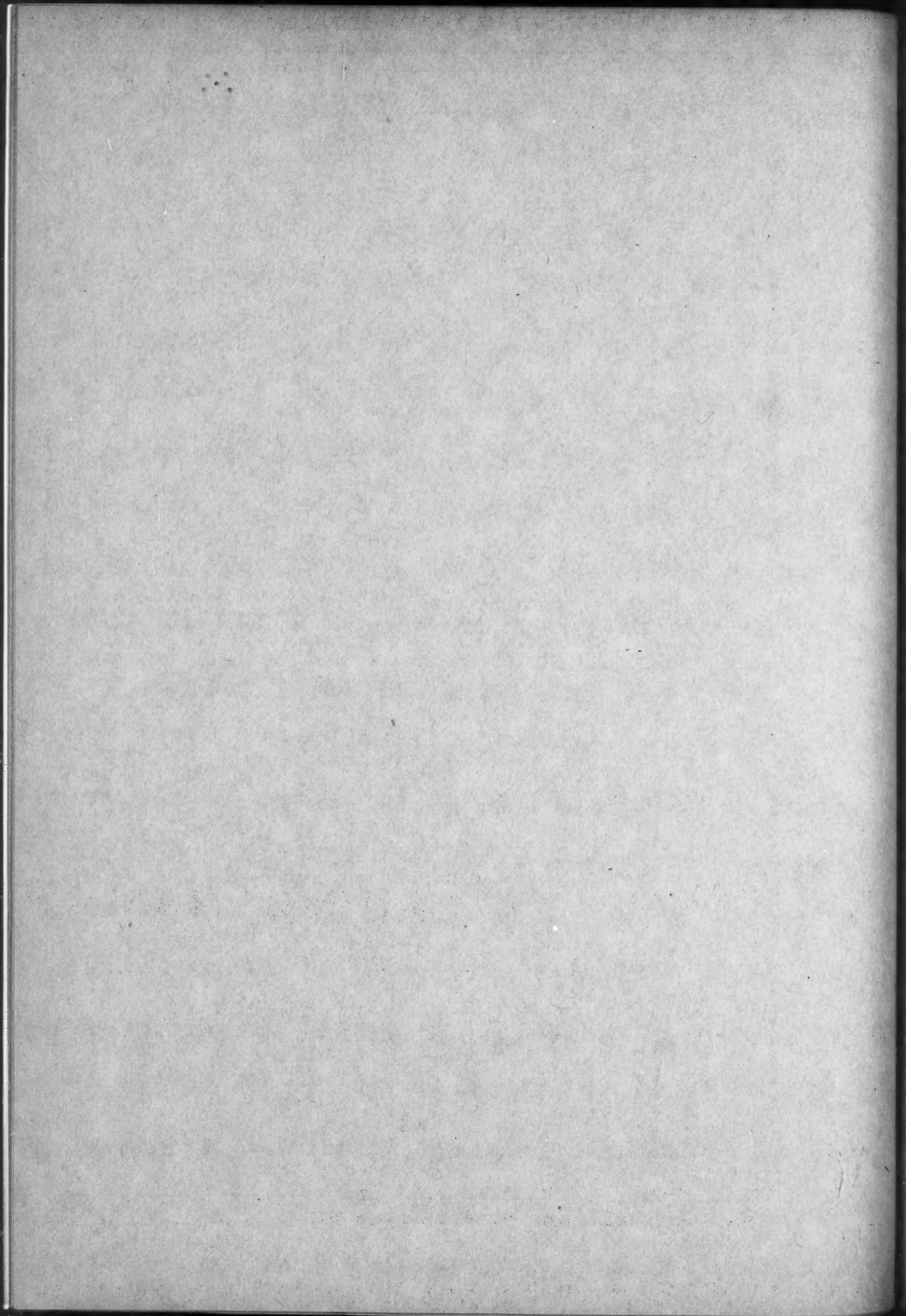
Mating Gear

The mating gear should be of cast iron or hard steel. Soft steel, brass, or soft bronze should be avoided. The teeth should be cut and in good condition for best results. For phenolic laminated pinions, the face of the mating gear should be the same or slightly greater than the pinion face.

MACHINERY'S Data Sheet No. 322, New Series, May, 1936

Recommended Practice of American Gear Manufacturers' Association, 1935

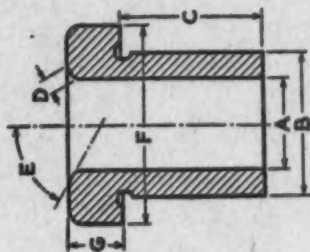
MACHINERY, May, 1936—576-A



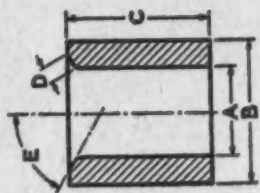
AMERICAN STANDARD JIG BUSHINGS—1

Press Fit Bushings. Press fit wearing bushings to guide the tool are for installation directly in the jig without the use of a liner and are employed principally where the bushings are used for short production runs and will not require replacement. They are intended

also for use where the closeness of the center distance of holes will not permit the installation of liners and renewable bushings. Press fit bushings are made in two types, with heads and without.



PRESS FIT, HEAD TYPE WEARING BUSHING



PRESS FIT, HEADLESS WEARING BUSHING

Table 1 Press Fit Wearing Bushings—Headless and Head Types

Range of Hole Size A	Up to and Including	Body Diameter B		Length C		Width of Chamfer D	Head Diameter E		Head Height G		
		Nominal	Max	Min	Short		Medium	Long	Max	Min	Max	Min
0.0000	1/16	1/16	0.178	0.171	1/16	1/16	1/16	1/16	1/16	1/16	1/16
0.0050	1/16	1/16	0.223	0.216	1/16	1/16	1/16	1/16	1/16	1/16	1/16
0.0100	1/16	1/16	0.270	0.263	1/16	1/16	1/16	1/16	1/16	1/16	1/16
0.0150	1/16	1/16	0.317	0.310	1/16	1/16	1/16	1/16	1/16	1/16	1/16
0.0200	1/16	1/16	0.364	0.357	1/16	1/16	1/16	1/16	1/16	1/16	1/16
0.0250	1/16	1/16	0.411	0.404	1/16	1/16	1/16	1/16	1/16	1/16	1/16
0.0300	1/16	1/16	0.458	0.451	1/16	1/16	1/16	1/16	1/16	1/16	1/16
0.0350	1/16	1/16	0.505	0.515	1/16	1/16	1/16	1/16	1/16	1/16	1/16
0.0400	1/16	1/16	0.552	0.565	1/16	1/16	1/16	1/16	1/16	1/16	1/16
0.0450	1/16	1/16	0.599	0.615	1/16	1/16	1/16	1/16	1/16	1/16	1/16
0.0500	1/16	1/16	0.646	0.665	1/16	1/16	1/16	1/16	1/16	1/16	1/16
0.0550	1/16	1/16	0.693	0.715	1/16	1/16	1/16	1/16	1/16	1/16	1/16
0.0600	1/16	1/16	0.740	0.765	1/16	1/16	1/16	1/16	1/16	1/16	1/16
0.0650	1/16	1/16	0.787	0.815	1/16	1/16	1/16	1/16	1/16	1/16	1/16
0.0700	1/16	1/16	0.834	0.865	1/16	1/16	1/16	1/16	1/16	1/16	1/16
0.0750	1/16	1/16	0.881	0.915	1/16	1/16	1/16	1/16	1/16	1/16	1/16
0.0800	1/16	1/16	0.928	0.965	1/16	1/16	1/16	1/16	1/16	1/16	1/16
0.0850	1/16	1/16	0.975	1.015	1/16	1/16	1/16	1/16	1/16	1/16	1/16
0.0900	1/16	1/16	1.022	1.065	1/16	1/16	1/16	1/16	1/16	1/16	1/16
0.0950	1/16	1/16	1.069	1.115	1/16	1/16	1/16	1/16	1/16	1/16	1/16
0.1000	1/16	1/16	1.116	1.165	1/16	1/16	1/16	1/16	1/16	1/16	1/16
0.1050	1/16	1/16	1.163	1.215	1/16	1/16	1/16	1/16	1/16	1/16	1/16
0.1100	1/16	1/16	1.210	1.265	1/16	1/16	1/16	1/16	1/16	1/16	1/16
0.1150	1/16	1/16	1.257	1.315	1/16	1/16	1/16	1/16	1/16	1/16	1/16
0.1200	1/16	1/16	1.304	1.365	1/16	1/16	1/16	1/16	1/16	1/16	1/16
0.1250	1/16	1/16	1.351	1.415	1/16	1/16	1/16	1/16	1/16	1/16	1/16
0.1300	1/16	1/16	1.398	1.465	1/16	1/16	1/16	1/16	1/16	1/16	1/16
0.1350	1/16	1/16	1.445	1.515	1/16	1/16	1/16	1/16	1/16	1/16	1/16
0.1400	1/16	1/16	1.492	1.565	1/16	1/16	1/16	1/16	1/16	1/16	1/16
0.1450	1/16	1/16	1.539	1.615	1/16	1/16	1/16	1/16	1/16	1/16	1/16
0.1500	1/16	1/16	1.586	1.665	1/16	1/16	1/16	1/16	1/16	1/16	1/16
0.1550	1/16	1/16	1.633	1.715	1/16	1/16	1/16	1/16	1/16	1/16	1/16
0.1600	1/16	1/16	1.680	1.765	1/16	1/16	1/16	1/16	1/16	1/16	1/16
0.1650	1/16	1/16	1.727	1.815	1/16	1/16	1/16	1/16	1/16	1/16	1/16
0.1700	1/16	1/16	1.774	1.865	1/16	1/16	1/16	1/16	1/16	1/16	1/16
0.1750	1/16	1/16	1.821	1.915	1/16	1/16	1/16	1/16	1/16	1/16	1/16
0.1800	1/16	1/16	1.868	1.965	1/16	1/16	1/16	1/16	1/16	1/16	1/16
0.1850	1/16	1/16	1.915	2.015	1/16	1/16	1/16	1/16	1/16	1/16	1/16
0.1900	1/16	1/16	1.962	2.065	1/16	1/16	1/16	1/16	1/16	1/16	1/16
0.1950	1/16	1/16	2.009	2.115	1/16	1/16	1/16	1/16	1/16	1/16	1/16
0.2000	1/16	1/16	2.056	2.165	1/16	1/16	1/16	1/16	1/16	1/16	1/16
0.2050	1/16	1/16	2.103	2.215	1/16	1/16	1/16	1/16	1/16	1/16	1/16
0.2100	1/16	1/16	2.150	2.265	1/16	1/16	1/16	1/16	1/16	1/16	1/16
0.2150	1/16	1/16	2.197	2.315	1/16	1/16	1/16	1/16	1/16	1/16	1/16
0.2200	1/16	1/16	2.244	2.365	1/16	1/16	1/16	1/16	1/16	1/16	1/16
0.2250	1/16	1/16	2.291	2.415	1/16	1/16	1/16	1/16	1/16	1/16	1/16
0.2300	1/16	1/16	2.338	2.465	1/16	1/16	1/16	1/16	1/16	1/16	1/16
0.2350	1/16	1/16	2.385	2.515	1/16	1/16	1/16	1/16	1/16	1/16	1/16
0.2400	1/16	1/16	2.432	2.565	1/16	1/16	1/16	1/16	1/16	1/16	1/16
0.2450	1/16	1/16	2.479	2.615	1/16	1/16	1/16	1/16	1/16	1/16	1/16
0.2500	1/16	1/16	2.526	2.665	1/16	1/16	1/16	1/16	1/16	1/16	1/16
0.2550	1/16	1/16	2.573	2.715	1/16	1/16	1/16	1/16	1/16	1/16	1/16
0.2600	1/16	1/16	2.620	2.765	1/16	1/16	1/16	1/16	1/16	1/16	1/16
0.2650	1/16	1/16	2.667	2.815	1/16	1/16	1/16	1/16	1/16	1/16	1/16
0.2700	1/16	1/16	2.714	2.865	1/16	1/16	1/16	1/16	1/16	1/16	1/16
0.2750	1/16	1/16	2.761	2.915	1/16	1/16	1/16	1/16	1/16	1/16	1/16
0.2800	1/16	1/16	2.808	2.965	1/16	1/16	1/16	1/16	1/16	1/16	1/16
0.2850	1/16	1/16	2.855	3.015	1/16	1/16	1/16	1/16	1/16	1/16	1/16
0.2900	1/16	1/16	2.902	3.065	1/16	1/16	1/16	1/16	1/16	1/16	1/16
0.2950	1/16	1/16	2.949	3.115	1/16	1/16	1/16	1/16	1/16	1/16	1/16
0.3000	1/16	1/16	3.000	3.165	1/16	1/16	1/16	1/16	1/16	1/16	1/16
0.3050	1/16	1/16	3.047	3.215	1/16	1/16	1/16	1/16	1/16	1/16	1/16
0.3100	1/16	1/16	3.094	3.265	1/16	1/16	1/16	1/16	1/16	1/16	1/16
0.3150	1/16	1/16	3.141	3.315	1/16	1/16	1/16	1/16	1/16	1/16	1/16
0.3200	1/16	1/16	3.188	3.365	1/16	1/16	1/16	1/16	1/16	1/16	1/16
0.3250	1/16	1/16	3.235	3.415	1/16	1/16	1/16	1/16	1/16	1/16	1/16
0.3300	1/16	1/16	3.282	3.465	1/16	1/16	1/16	1/16	1/16	1/16	1/16
0.3350	1/16	1/16	3.329	3.515	1/16	1/16	1/16	1/16	1/16	1/16	1/16
0.3400	1/16	1/16	3.376	3.565	1/16	1/16	1/16	1/16	1/16	1/16	1/16
0.3450	1/16	1/16	3.423	3.615	1/16	1/16	1/16	1/16	1/16	1/16	1/16
0.3500	1/16	1/16	3.470	3.665	1/16	1/16	1/16	1/16	1/16	1/16	1/16
0.3550	1/16	1/16	3.517	3.715	1/16	1/16	1/16	1/16	1/16	1/16	1/16
0.3600	1/16	1/16	3.564	3.765	1/16	1/16	1/16	1/16	1/16	1/16	1/16
0.3650	1/16	1/16	3.611	3.815	1/16	1/16	1/16	1/16	1/16	1/16	1/16
0.3700	1/16	1/16	3.658	3.865	1/16	1/16	1/16	1/16	1/16	1/16	1/16
0.3750	1/16	1/16	3.705	3.915	1/16	1/16	1/16	1/16	1/16	1/16	1/16
0.3800	1/16	1/16	3.752	3.965	1/16	1/16	1/16	1/16	1/16	1/16	1/16
0.3850	1/16	1/16	3.799	4.015	1/16	1/16	1/16	1/16	1/16	1/16	1/16
0.3900	1/16	1/16	3.846	4.065	1/16	1/16	1/16	1/16	1/16	1/16	1/16
0.3950	1/16	1/16	3.893	4.115	1/16	1/16	1/16	1/16	1/16	1/16	1/16
0.4000	1/16	1/16	3.940	4.165	1/16	1/16	1/16	1/16	1/16	1/16	1/16
0.4050	1/16	1/16	3.987	4.215	1/16	1/16	1/16	1/16	1/16	1/16	1/16
0.4100	1/16	1/16	4.034	4.265	1/16	1/16	1/16	1/16	1/16	1/16	1/16
0.4150	1/16	1/16	4.081	4.315	1/16	1/16	1/16	1/16	1/16	1/16	1/16
0.4200	1/16	1/16	4.128	4.365	1/16	1/16	1/16	1/16	1/16	1/16	1/16
0.4250	1/16	1/16	4.175	4.415	1/16	1/16	1/16	1/16	1/16	1/16	1/16
0.4300	1/16	1/16	4.222	4.465	1/16	1/16	1/16	1/16	1/16	1/16	1/16
0.4350	1/16	1/16	4.269	4.515	1/16	1/16	1/16	1/16	1/16	1/16	1/16
0.4400	1/16	1/16	4.316	4.565	1/16	1/16	1/16	1/16	1/16	1/16	1/16
0.4450	1/16	1/16	4.363	4.615	1/16	1/16	1/16	1/16	1/16	1/16	1/16
0.4500	1/16	1/16	4.410	4.665	1/16	1/16	1/16	1/16	1/16	1/16	1/16
0.4550	1/16	1/16	4.457	4.715	1/16	1/16	1/16	1/16	1/16	1/16	1/16
0.4600	1/16	1/16	4.504	4.765	1/16	1/16	1/16	1/16	1/16	1/16	1/16
0.4650	1/16	1/16	4.551	4.815	1/16	1/16	1/16	1/16	1/16	1/16	1/16
0.4700	1/16	1/16	4.598	4.865	1/16	1/16	1/16	1/16	1/16	1/16	1/16
0.4750	1/16	1/16	4.645	4.915	1/16	1/16	1/16	1/16	1/16	1/16	1/16
0.4800	1/16	1/16	4.692	4.965	1/16	1/16	1/16	1/16	1/16	1/16	1/16
0.4850	1/16	1/16	4.739	5.015	1/16	1/16	1/16	1/16	1/16	1/16	1/16
0.4900	1/16	1/16	4.786	5.065	1/16	1/16	1/16	1/16	1/16	1/16	1/16
0.4950	1/16	1/16	4.833	5.115	1/16	1/16	1/16	1/16	1/16	1/16	1/16
0.5000	1/16	1/16	4.880	5.165	1/16	1/16	1/16	1/16	1/16	1/16	1/16
0.5050	1/16	1/16	4.927	5.215	1/16	1/16	1/16	1/16	1/16	1/16	1/16
0.5100	1/16	1/16	4.974	5.265	1/16	1/16	1/16	1/16	1/16	1/16	1/16
0.5150	1/16	1/16	5.021	5.315	1/16	1/16	1/16	1/16	1/16	1/16	1/16
0.5200	1/16	1/16	5.068	5.365	1/16	1/16	1/16	1/16	1/16	1/16	1/16
0.5250	1/16	1/16	5.115	5.415							

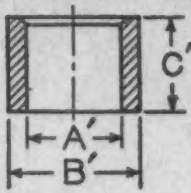
THE UNIVERSITY OF CHICAGO PRESS

CHICAGO, ILL. U.S.A.

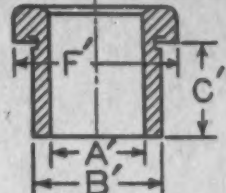
MACHINERY'S DATA SHEETS 325 and 326

AMERICAN STANDARD JIG BUSHINGS—3

Liner Bushings. Liner bushings are provided with and without heads and are permanently installed in a jig to receive the renewable wearing bushings. They are sometimes called "master bushings."



HEADLESS
LINER BUSHING



HEAD TYPE
LINER BUSHING

Table 3 Liner Bushings—Headless and Head* Type

Range of Hole Size in Renewable Wearing Bushings ¹		Inside Diameter A'			Body Diameter ² B'			Length ³ C'			Head ⁴ Diameter F	
From	Up to and Including	Nomi-nal	Max	Min	Nomi-nal	Max	Min	Short ⁵	Me-dium ⁵	Long ⁵	Max	Min
0.0000	5/32	5/16	0.3129	0.3126	1/2	0.520	0.515	5/16	1/2	3/4	5/8	17/32
0.1610	5/16	1/2	0.5005	0.5002	3/4	0.770	0.765	5/16	1/2	3/4	1 1/16	25/32
0.3160	1/2	3/4	0.7506	0.7503	1—	1.020	1.015	1/2	3/4	1—	1 1/4	1 1/32
33/64	3/4	1—	1.0007	1.0004	1 3/4	1.395	1.390	3/4	1—	1 3/4	1 1/2	1 13/32
49/64	1—	1 3/4	1.3760	1.3756	1 3/4	1.770	1.765	3/4	1—	1 3/4	2—	1 25/32
1 1/64	1 3/4	1 3/4	1.7512	1.7508	2 1/4	2.270	2.265	1—	1 3/4	1 3/4	2 1/2	2 9/32
1 25/64	1 3/4	2 1/4	2.2515	2.2510	2 3/4	2.770	2.765	1—	1 3/4	1 3/4	3—	2 25/32

All dimensions given in inches.
¹ For detail dimensions of renewable wearing bushings see Table 2.*
² The minimum body diameter, B', is 0.15 to 0.020 in. larger than the nominal diameter in order to provide grinding stock for fitting to jig plate holes.
³ Tolerance on fractional dimensions where not otherwise specified shall be ±0.010 inch.
⁴ The length, C', is the overall length for the headless type and the length under head for the head type.
⁵ The head design shall be in accordance with the manufacturer's practice within the limits of diameter specified.
⁶ When renewable wearing bushings are to be used with liner bushings of the head type, the length under head, C (Table 2), should be increased in each case by the thickness of the liner bushing head.

INFORMATION REQUIRED WHEN ORDERING TOOL STEEL

Quantity Required—State the quantity required in pounds, feet, or number of pieces, and state whether exact or random lengths are desired.

Size Required—State carefully the section or shape, such as round, square, flat, octagon, special, and whether a round-cornered or square-cornered edge is desired in square or flat sizes. Give accurately the dimensions, such as diameter, or width and thickness of flat sections. In ordering octagons, give the size as the distance between parallel flat surfaces. Special shapes should be sketched and dimensioned accurately. Specify any special tolerances on dimensions which may be required. All dimensions are assumed to be rough dimensions. If finished sizes, it should be so stated.

Condition and Finish—Specify whether the material is to be:
Hot-rolled
Hammered
Rough-turned
Cold-rolled
Cold-drawn
Centerless-ground

State the condition in which the material is desired:
Natural
Annealed
Heat-treated

If heat-treated material is desired, state approximate hardness of the heat-treated steel. If definite hardness limits are required, it must be so stated.

In ordering steel for die-blocks, forgings, etc., that are to be subsequently machined, state whether the sizes given are the rough sizes or the dimensions expected on the finished product.

Allowance for Finish—Tool steels require a hard surface for successful use, and it is therefore unwise to have

too close an allowance between the forged or rolled size and the finished size of the tool required. With the exception of the cobalt high-speed steels, which decarburize more deeply and require somewhat greater allowance, the following may be taken as a guide for the allowance to be made for decarburized surfaces. This applies to hot-rolled or hammered bars; it does not apply to cold-drawn or centerless-ground material, because such operations tend to reduce the depth of decarburization.

Size of Material, Inches	Minimum Allowance on Diameter, Inch
1/2 or under	1/32
1/2 to 2	1/16
2 to 3	1/8
3 to 4 3/4	1/4
4 3/4 to 8	3/8

Such allowances should insure absolute safety from soft spots on the surface of the tool.

When steels are to be turned down, care should be taken to see that the material is well centered on the lathe, so that the allowance for finishing is taken off evenly on all parts of the circumference.

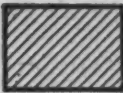
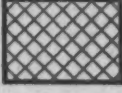
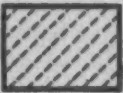
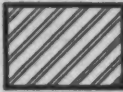

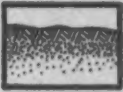
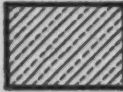
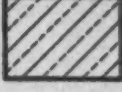

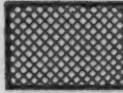


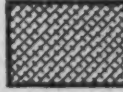

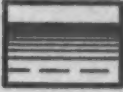



Shipping Instructions—Give full and complete shipping instructions, including any special routing instructions—whether freight, express, parcel post, boat, etc.—and details as to the packing or boxing desired.

Purpose—State clearly on every order the purpose for which the steel is to be used. This may allow the steel manufacturer to prevent a misapplication and to recommend other steels which may be more suitable for the purpose than that ordered, and at the same time to put the steel shipped in the best condition for the particular application for which it is intended.

MACHINERY'S DATA SHEETS 327 and 328

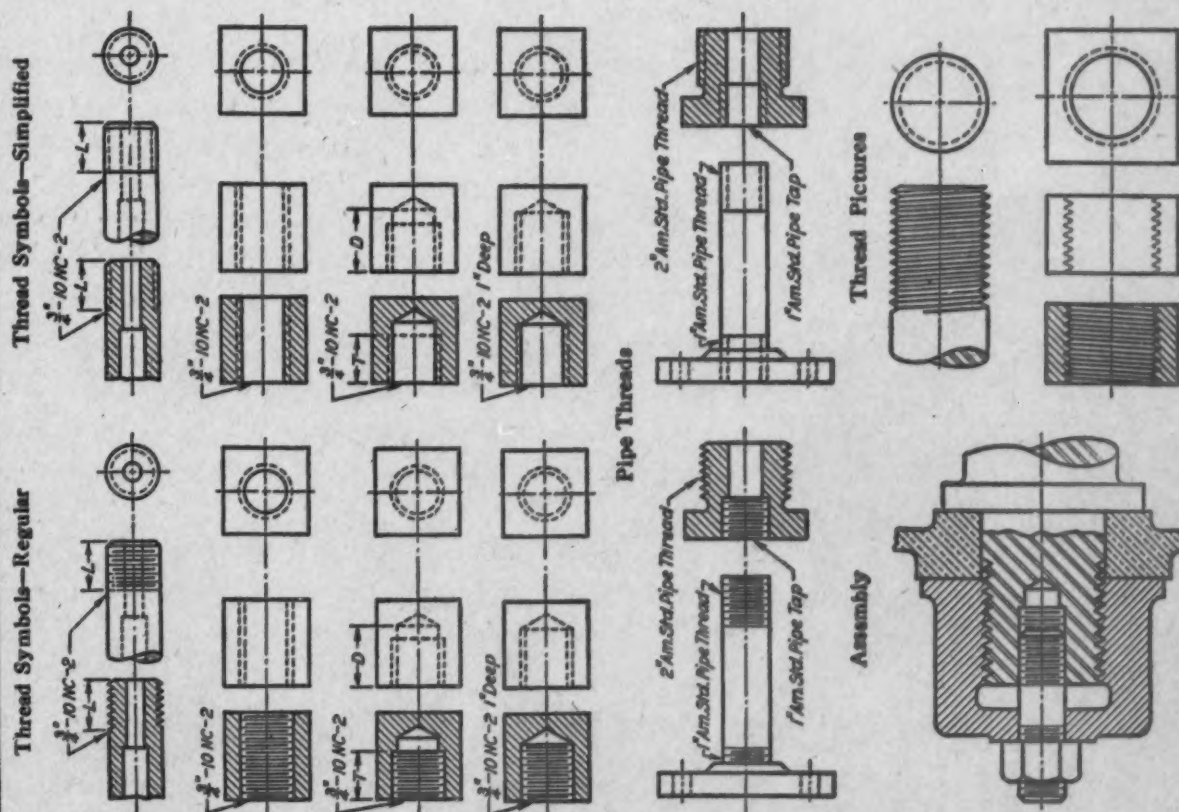
SYMBOLS FOR SECTION LINING

Approved by American Standards Association, May, 1935

	Cast iron.		Sound or heat insulation. Cork, hair-felt, wool, asbestos, magnesia, packing, etc.		Marble, slate, glass, porcelain, etc.
	Steel.		Flexible material. Fabric, felt, rubber, etc.		Earth.
	Bronze, brass, copper and compositions.		Fire brick and refractory material.		Rock.
	White metal, zinc, lead, babbitt and alloys.		Electric windings, electro magnets, resistance, etc.		Sand.
	Aluminum and aluminum alloys.		Concrete.		Water and other liquids.
	Electric insulation, Vulcanite, fibre, mica, Bakelite, etc. Show solid for narrow sections.		Brick or stone masonry.		Across grain } Wood. With grain }

MACHINERY'S Data Sheet No. 327, New Series, August, 1936

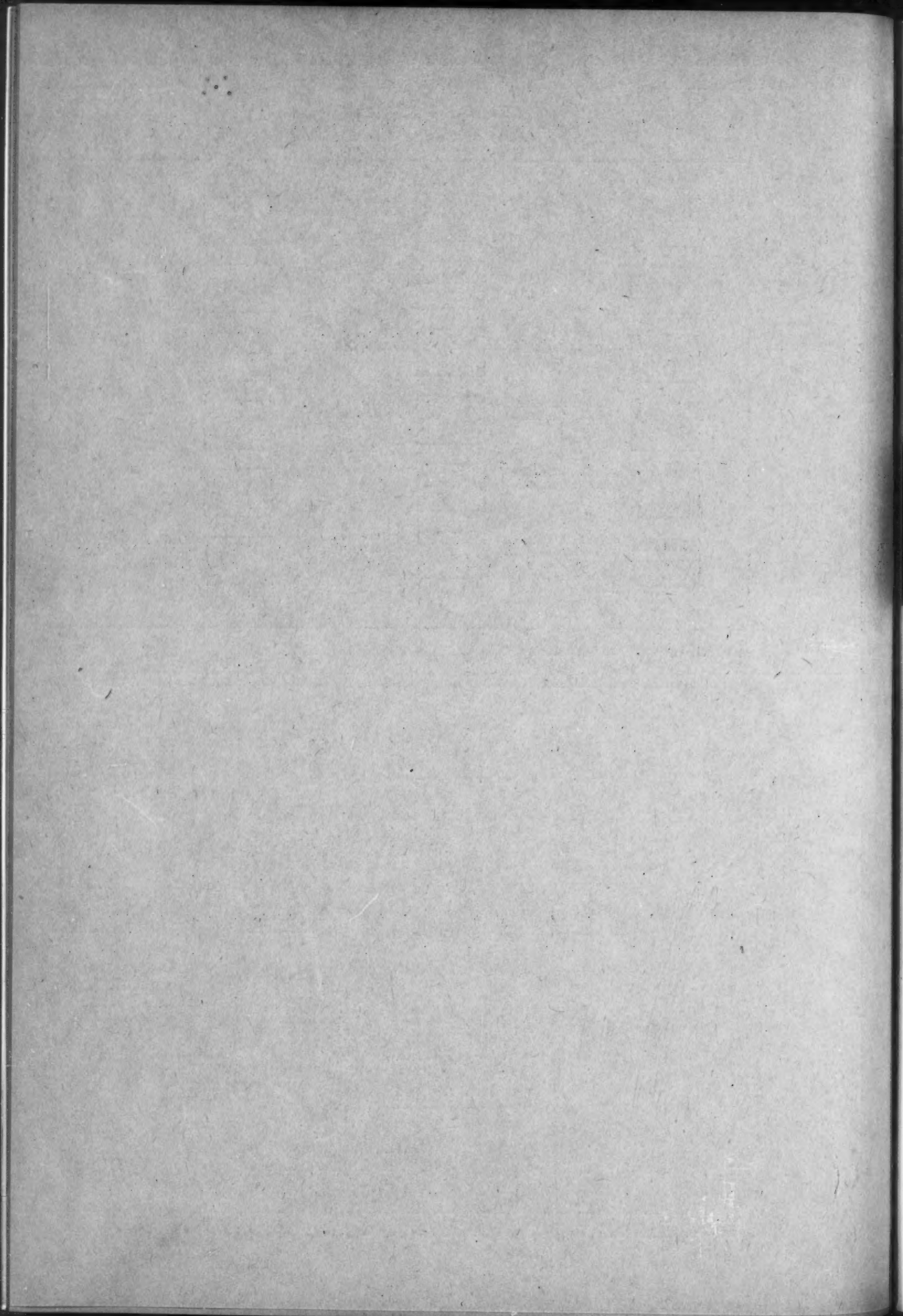
METHODS OF REPRESENTING SCREW THREADS



MACHINERY'S Data Sheet No. 328, New Series, August, 1936

Approved by American Standards Association, May, 1935

MACHINERY, August, 1936—768-A





In the 1890's the covered wooden bridge was typical of the structure necessary to the needs of the day. Loads were not heavy, traffic was light — in comparison to 1936.

San Francisco's Golden Gate Bridge is typical of the change brought by necessity — the necessity for greater structures to meet the demands of progress.

Realizing the necessity to keep pace with progress, Lodge & Shipley never hesitated to include a change when that change promised greater achievement. That policy has guided the makers of L & S Lathes since 1893 — and has earned for them an enviable reputation through these last 43 years. An examination of the possibilities, range and versatility of any product of L & S will substantiate their contributions to Progress!

THE LODGE & SHIPLEY MACHINE TOOL CO.
CINCINNATI, OHIO, U. S. A.

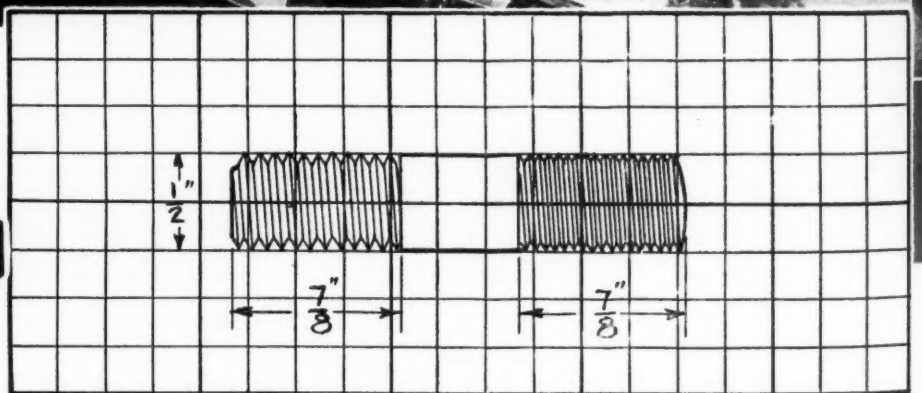
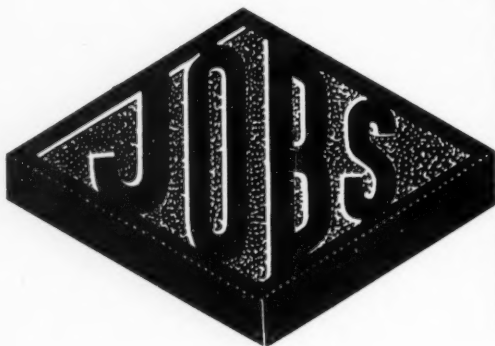
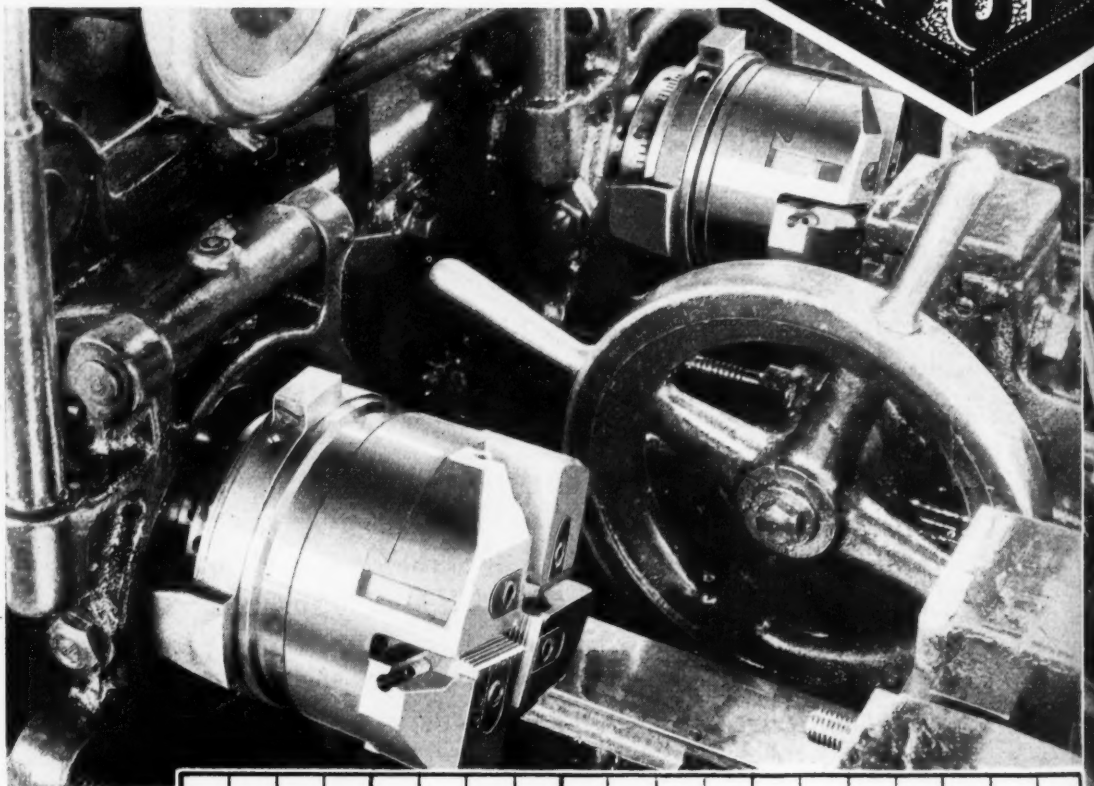
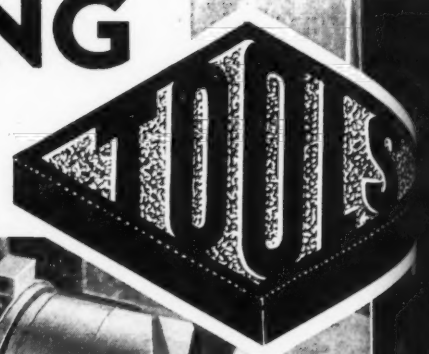


"The World Turns Best on
LODGE & SHIPLEY LATHES"

MACHINERY, August, 1936—3

STUDS

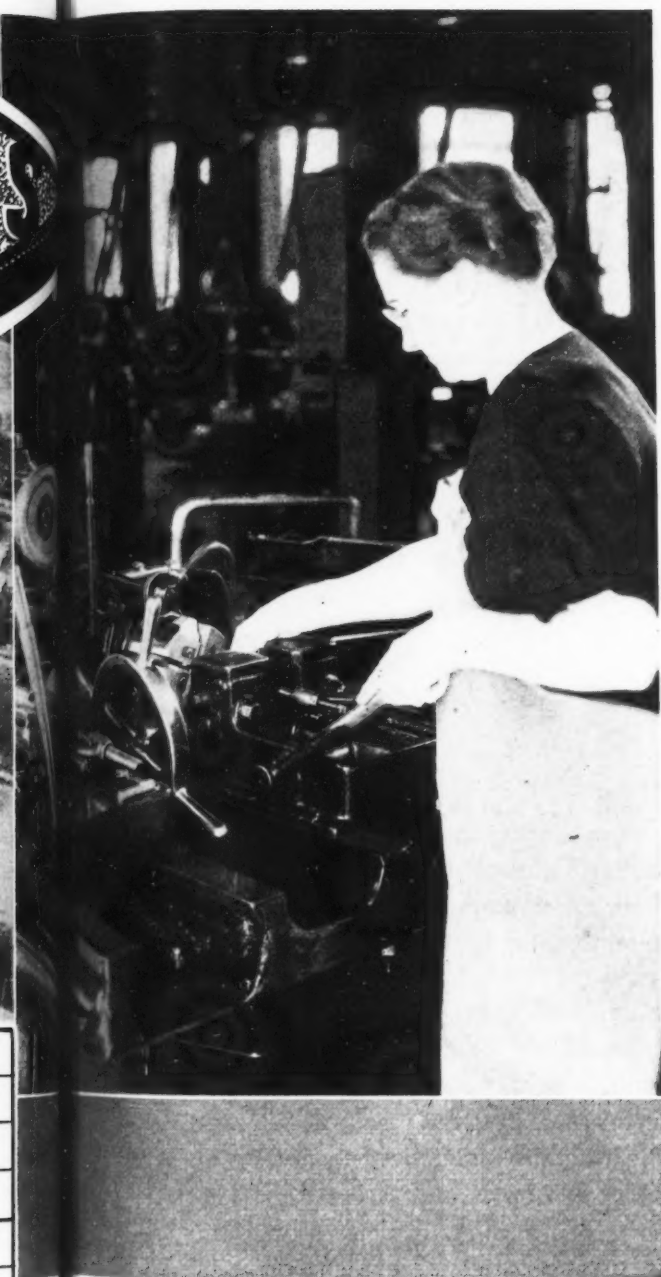
worth **STUDYING**



Specifications

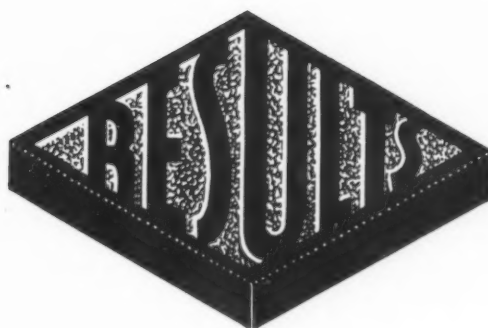
Name of manufacturer The
Brown Corporation—Syracuse, N. Y.
Part—Stud
Material—Bar Stock 3135—cold
worked.
Brinell—193

Thread—Diameter $\frac{1}{2}$ "
Pitch 13 and 20
Form U. S. F.
Thread Limits—.002"
Thread Length— $\frac{7}{8}$ "



Equipment used

LANDIS Double Head Threading Machine equipped with $\frac{7}{8}$ " LANCO Hardened and Ground Die Heads.



200 complete pieces per hour

A man's size job, easily handled by a woman. That briefly describes the threading of studs at the Brown Corporation's shop at Syracuse, N. Y.

In regular production, an average of 200 complete pieces are threaded in an hour at a cutting speed of 125 R.P.M.

And this rate is maintained with a minimum of tool expense, approximately 1800 pieces being obtained between chaser grinds.

Exceptional performance?

Not at all. Just another typical example of high quality-quantity thread production at low cost with LANDIS threading tools. The fact that skilled hands are not required to achieve these results is another factor which results in production savings.

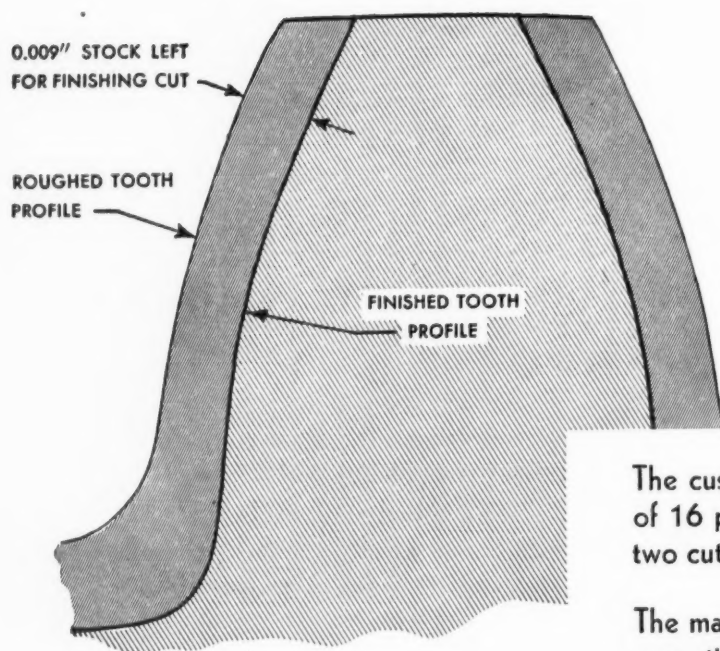
Your thread production is worth studying, too, in order to find out where costs can be cut. Landis will gladly help you make such a study.

LANDIS MACHINE CO. WAYNESBORO PENNA. . . .

MACHINERY, August, 1936—5

Why GEAR CUTTING is FASTER

WITH THE New GAP-TYPE



24 tooth, 32 pitch pinion rough-cut and finish-cut with same cutter, showing amount of stock left for the finishing cut. Same cutter teeth used for roughing and finishing.

• AS IT HAS BEEN DONE

The customary practice followed in the cutting of gears of 16 pitch and finer is to rough and finish the gear in two cuts, using the same cutter teeth for both operations.

The majority of the material is removed in the roughing operation, which naturally dulls the teeth more than does the finishing cut, thus requiring more frequent sharpening of the cutter if the best possible results are desired. Naturally, also, the roughing operation cannot be accomplished as rapidly as would be the case if the same teeth were not used for finishing. A new and better way is to use a gap-type cutter, as explained on the opposite page.

The Fellows Line of Products includes:

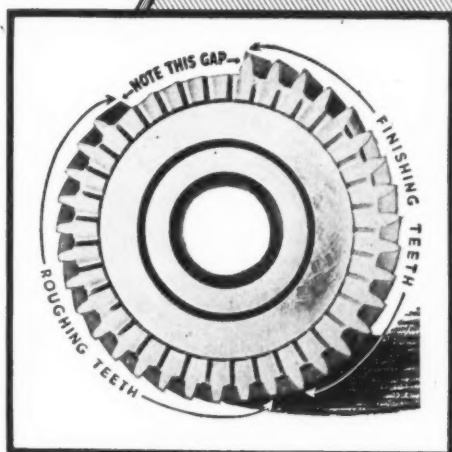
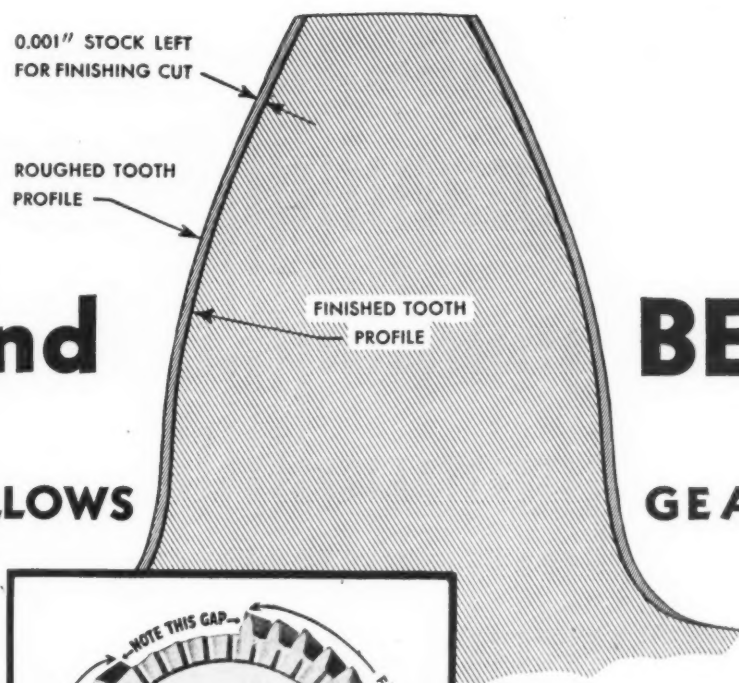
GEAR SHAPERS • THREAD GENERATORS • HOURGLASS GEAR SHAPERS • COMPLETE LINE OF CUTTERS • HELICAL CUTTER SHARPENER • BURNISHING

and

FELLOWS

BETTER . . .

GEAR SHAPER CUTTER



Same pinion rough-cut and finish-cut with gap-type cutter shown. Greater accuracy is obtained and production increased 50%.

• THE NEW AND BETTER WAY IS TO USE A FELLOWS GAP-TYPE CUTTER

By this method the majority of the stock is removed by one row of teeth, and the finishing done by a separate row of teeth, resulting in:

**GREATER ACCURACY
LONGER CUTTER LIFE
HIGHER PRODUCTION**

The roughing teeth can be given a heavier feed, as these same teeth are not used for finishing. Each finishing cutter tooth cuts its mating tooth space, thus eliminating accumulative errors.

The GAP TYPE Cutter method is especially applicable to the cutting of gears for motion picture cameras, sound movie projectors, indicating and recording instruments and other ultra-precision assemblies.

You may be able to apply it with profitable advantage to your work. Ask for new circular describing this latest small gear cutting development. Write:

THE FELLOWS GEAR SHAPER COMPANY

Springfield, Vermont, U. S. A.
616 Fisher Building, Detroit, Mich.

GEARS • LAPS & LAPPING MACHINES • MASTER GEARS

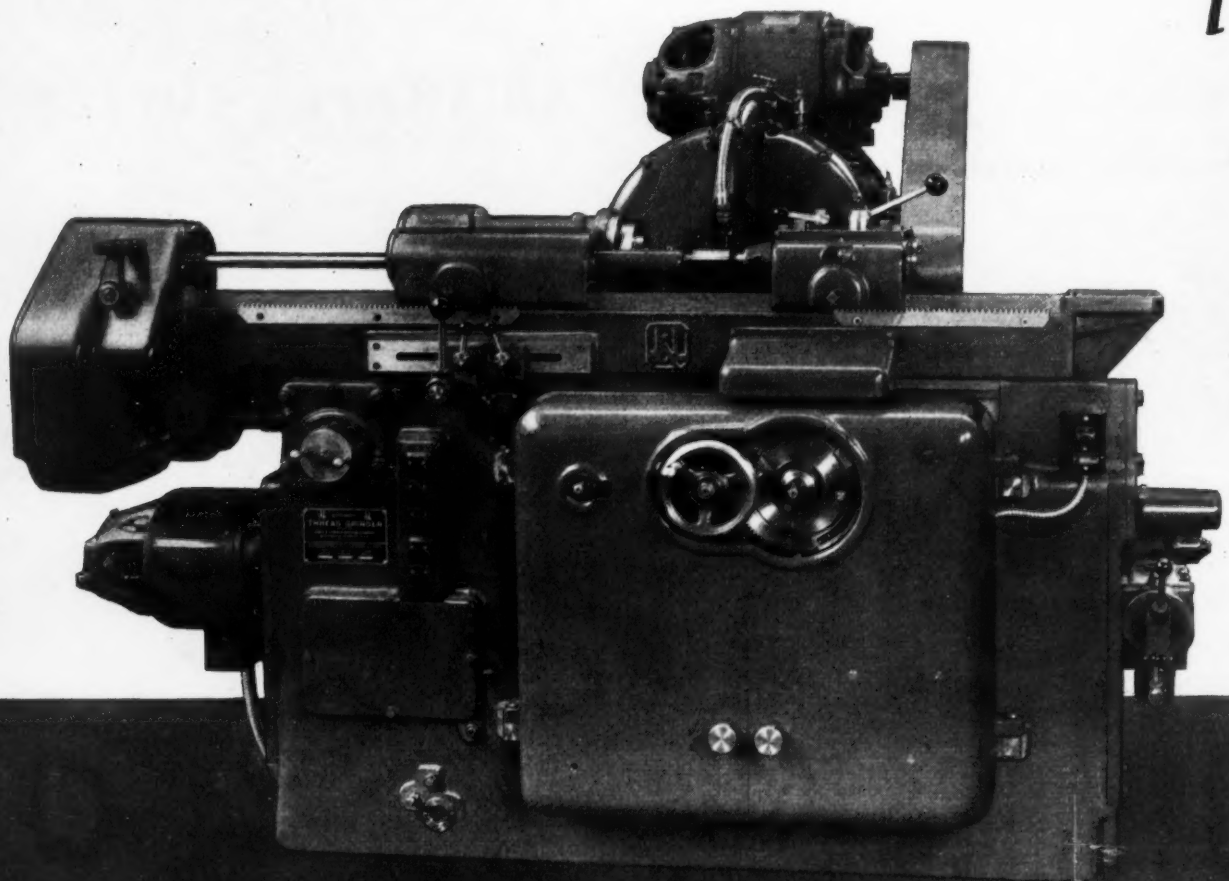
FELLOWS
~ GEAR SHAPER ~
METHODS

TESTING EQUIPMENT

MACHINERY, August, 1936—7



Announcing



**A NEW
AUTOMATIC
THREAD GRINDING MACHINE**

**"A MACHINE WITH A BACK-
GROUND OF 18 YEARS OF
PRECISION THREAD GRINDING
EXPERIENCE"**

JONES & LAMSON MACHINE COMPANY
(THREAD TOOL DIVISION)

A NEW THREAD GRINDING MACHINE—for thread grinding in hard or soft materials, for large lot production on machine components or for tool room work on taps, hobs, etc. It also makes possible the threading of intermittent surfaces such as those broken up by slots or keyways.

A NEW THREAD GRINDING PROCESS—the new machine is the embodiment of a new process. The grinder is designed about the trueing device as the primary element. With no attention from the operator and without disturbing the size adjustment to which the machine is continuously set, the wheel is kept sharp continually throughout its effective life. In consequence, metal is removed by a true cutting action in the form of microscopic chips instead of as dust; and in further consequence, a remarkably high rate of metal removal is obtained without burning the work; and heavy cuts can be taken without sacrificing accuracy. To sum up: the self-trueing, self-sizing mechanism of this machine brings thread grinding into the range of practical shop operations.

SPECIFICATIONS — the J&L Automatic Thread Grinding Machine will grind straight or taper or combination of straight and taper threads without adjustment of the wheel trueing device. It will grind single, double, triple, quadruple, and sextuple threads. Automatic wheel trueing and automatic sizing of work. It will back off, or relieve, straight or taper taps, or hobs, with either straight or spiral flutes. It will grind button type hobs, or circular chasers, without lead. Also grind and relieve thread hobs without lead. It will grind one way with quick return, or both ways. *No compensation for lead is required under any conditions, nor is it necessary to readjust the angle of the trueing device when helix angle is changed.*

STANDARD CAPACITY — 8" maximum thread diameter and 9" maximum thread length. 11½" maximum diameter of work and 31" maximum work length between centers. The machine will grind 9" of thread anywhere on 24" work. A 20" wheel is furnished as standard equipment.

Detailed description will be found in our new booklet. It will be sent on request.

SPRINGFIELD, VERMONT, U. S. A.



CINCINNATI

**MILLING
MACHINES**



**GRINDING
MACHINES**

Guardian OF ACCURACY

A dividing head is used for some of the most accurate machining operations performed by a milling machine. And Clair—with 30 years of service to his credit and long training in the department in which our dividing heads are made—looks for “errors in perfection” with alertness and skill that lets nothing get by.

Eye glued to a microscope equipped with micrometer adjustment, Clair reads any errors in the worm wheel and worm to

.000025"—not only the errors in pitch but also inaccuracies of tooth face. The maximum he allows is a cumulative error of not more than .0015" on a 12" circle.

Every Cincinnati Dividing Head is tested in this meticulous manner and a record is kept. The price of perfection is unremitting vigilance and Clair's work is typical of the guardians of accuracy who see that every part made in our shop is up to the high standards set to insure your satisfaction.

**THE CINCINNATI MILLING MACHINE CO.
CINCINNATI GRINDERS INCORPORATED**
Cincinnati, Ohio, U. S. A.

THE CINCINNATI DIVIDING HEAD



REEVES-CONTROLLED PRODUCTION PRAISED AS PHILCO RADIOS HIT 7 MILLION MARK ★ ★



More than 75 REEVES Variable Speed Transmissions control PHILCO production lines — make changing of models a "very simple matter."

Typical application (enclosure removed) of REEVES Transmission on Philco conveyor. Various assembly lines are synchronized to attain desired volume and peak capacity. Drastic changes in production are met quickly and accurately, without confusion or lost motion.



Mayor Wilson, of Philadelphia and L. E. Gubb, president of Philco Radio and Television Corp., okay 7-millionth PHILCO as it comes off the line.

● IN SPEAKING of their world's record of 7 million radio sets, PHILCO production engineers say:

"We want to give REEVES Variable Speed Transmissions credit for their important part in keeping our assembly conveyors perfectly timed and under instant, accurate control. With this efficient speed regulation, we have found necessary change-overs from one model to another a very simple matter."

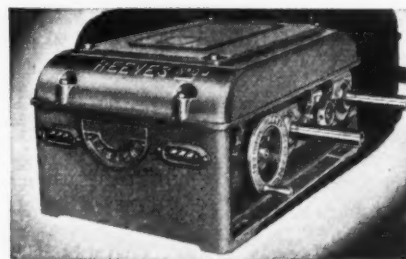
Many of the REEVES Variable Speed Transmissions in this plant, have had a part in the making of all 7 million PHILCO radio sets! As the need appears, other REEVES units are being installed.

Here is evidence of REEVES efficiency,

dependability and precision that production men can "get their teeth in." Not theories, but FACTS. REEVES speed control applied with eminent success in a plant where inaccurate, inflexible timing of production is *not* tolerated!

Whatever your needs for variable speed control, REEVES is equipped both in experience and in their *complete line* to do your job better. REEVES engineers will assist you, without obligation...

Write for REEVES Speed Control Handbook M-36, containing further factual information on modern speed regulation. Reeves Pulley Co., Columbus, Indiana.



This is the compact REEVES Horizontal Enclosed Design — one unit from the complete REEVES line of sizes, designs, speed ratios, and controls. There's a correct unit for every industrial need.



REEVES VARIABLE SPEED TRANSMISSIONS

The

New

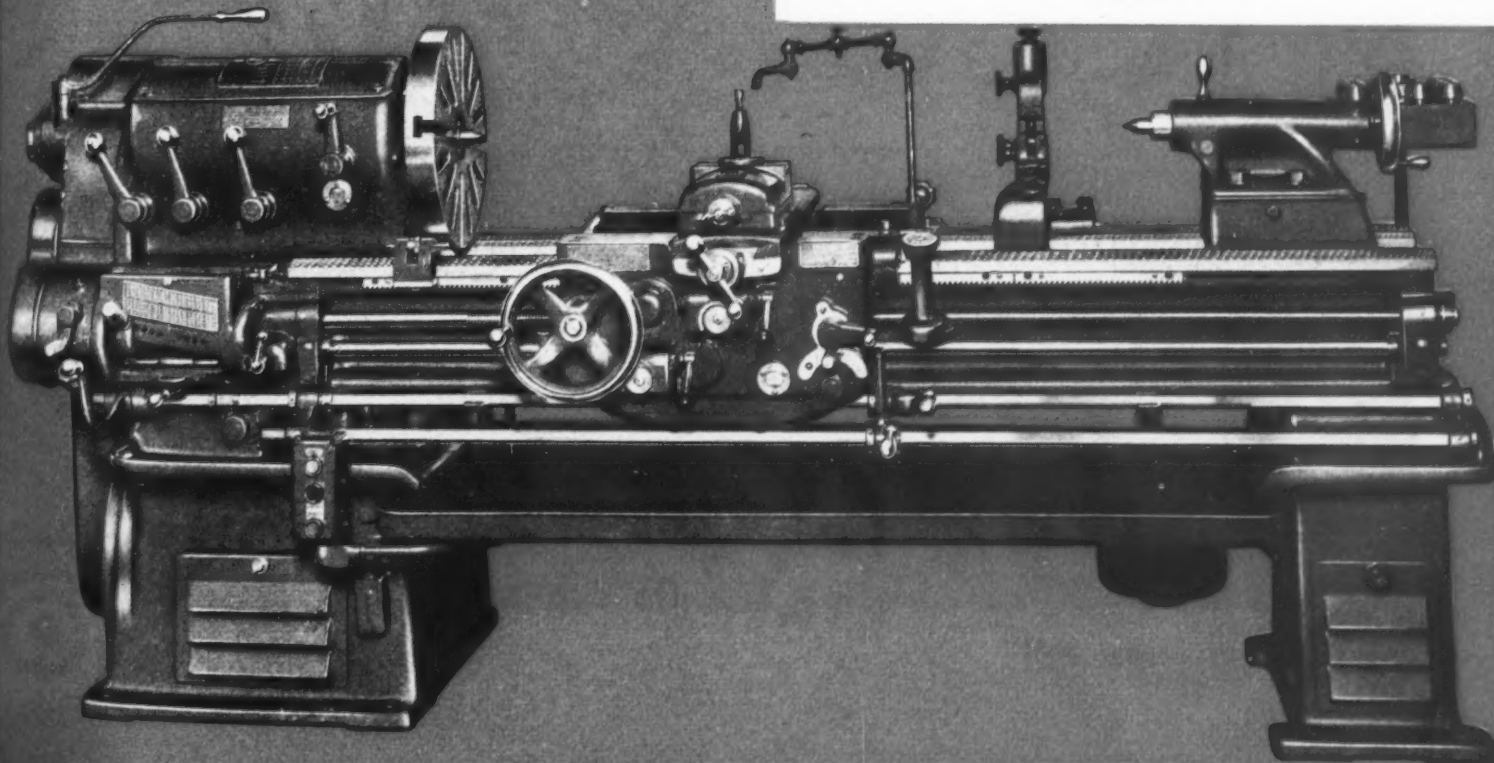
REED-PRENTICE Standard Spindle Nose

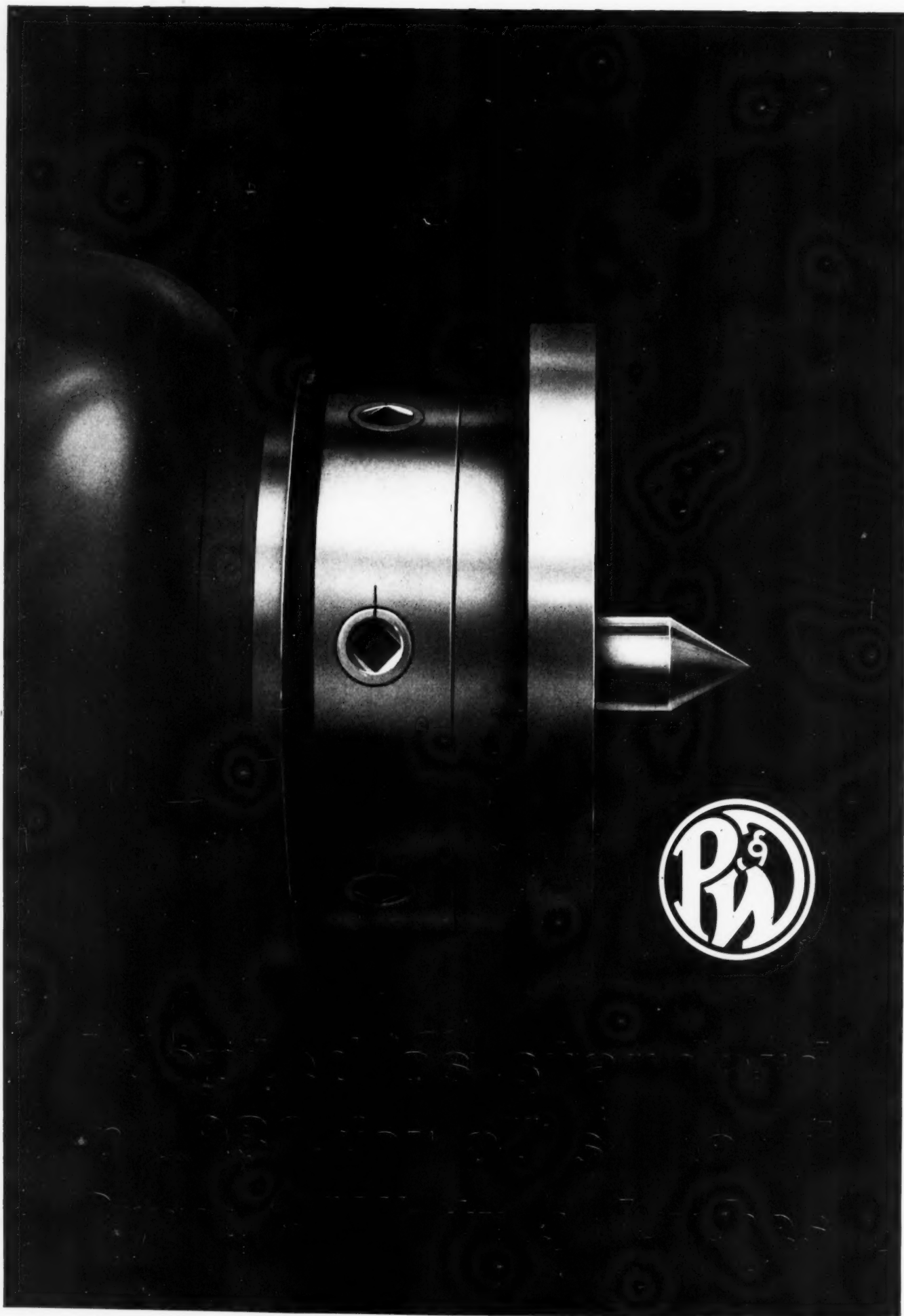


—is now featured on the 14" and 16" Model "AA" Sliding Gear Head Engine and Model "B" Tool Room Lathes. This new nose is especially designed for easier and more accurate placement of chucks, face plates, etc. This feature is a practical improvement . . . safe . . . easy to clean . . . economical . . . with less overhang, and many other advantages. It's a time saver—cutting down the manipulation of a face plate, for example, to some 12 seconds! It's a money-saver—providing reduced labor and equipment through simplicity and interchangeability . . . long life and economy through REED-PRENTICE up-to-the-minute practicability. A request from an authorized executive will bring details and specifications covering this new Standard Spindle Nose—and REED-PRENTICE Model "AA" and "B" Lathes.

REED-PRENTICE Lathes embody all the worth-while modern features such as the new Standard Spindle Nose; forced feed lubrication for headstock, apron, bed and carriage ways; anti-friction construction throughout; GROUND headstock gears, etc.

REED-PRENTICE CORP.
WORCESTER MASS., U.S.A.



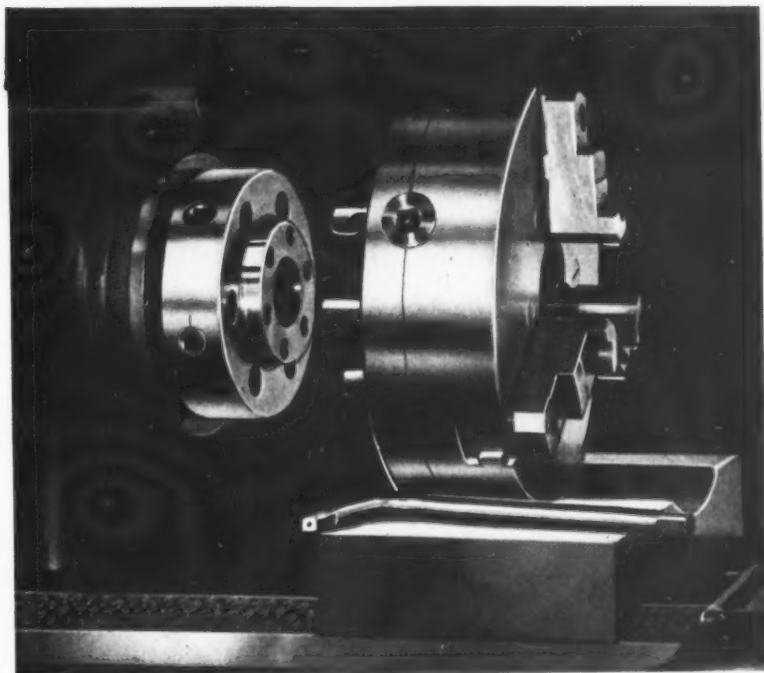


1932-1934 *Experimental*

This was the experimental period of the Pratt & Whitney Cam Lock Lathe Spindle Nose. The design was completed by Pratt & Whitney engineers in 1932, but it was subjected to rigorous shop tests for two years.

1935 *Cleveland*

In September, 1935, the Pratt & Whitney Cam Lock Lathe Spindle Nose was announced at the Cleveland Exposition of the National Machine Tool Builders' Association. The new Model C Lathes introduced there by Pratt & Whitney were equipped with it.



The Pratt & Whitney Cam Lock Spindle Nose

1936-*Standard*

THE results obtained with the Pratt & Whitney Cam Lock Spindle Nose have been so satisfactory that in 1936 it has been adopted as standard on all sizes of Pratt & Whitney lathes.

This new spindle nose has the advantage of tremendous rigidity in holding the chuck or face plate on the spindle. The latter cannot be thrown off when the spindle is stopped suddenly.

In the Cam Lock Spindle Nose there are no threads to be damaged or to catch dirt or chips which would interfere with the proper function-

ing of such a thread. There are no loose parts to be lost. It is easier to mount and unmount a chuck on the Cam Lock Spindle Nose than on any other known type.

In actual use the P&W Cam Lock Spindle Nose has proved its excellence, and has received highly favorable comment. Repeat orders have been numerous, and are the best proof of all.

We will be glad to give you complete information on Pratt & Whitney lathes equipped with the new Cam Lock Spindle Nose. A request from any shop executive on his own letterhead will bring some interesting literature by return mail.

Accurate Cam Lock Spindle Nose Gages have been standardized and are available to all lathe and chuck manufacturers. This assures interchangeability of chucks on all lathes using the Cam Lock Spindle Nose, and is of decided importance to lathe users.

PRATT & WHITNEY DIVISION

NILES-BEMENT-POND COMPANY

HARTFORD, CONN., U. S. A.

Branch Offices and Agencies:—BIRMINGHAM
LOS ANGELES

NEW YORK

PHILADELPHIA

BOSTON

PITTSBURGH

CHICAGO

ROCHESTER

CINCINNATI

CLEVELAND

SAN FRANCISCO

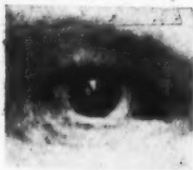
DETROIT

ST. LOUIS

MACHINERY, August, 1936—15

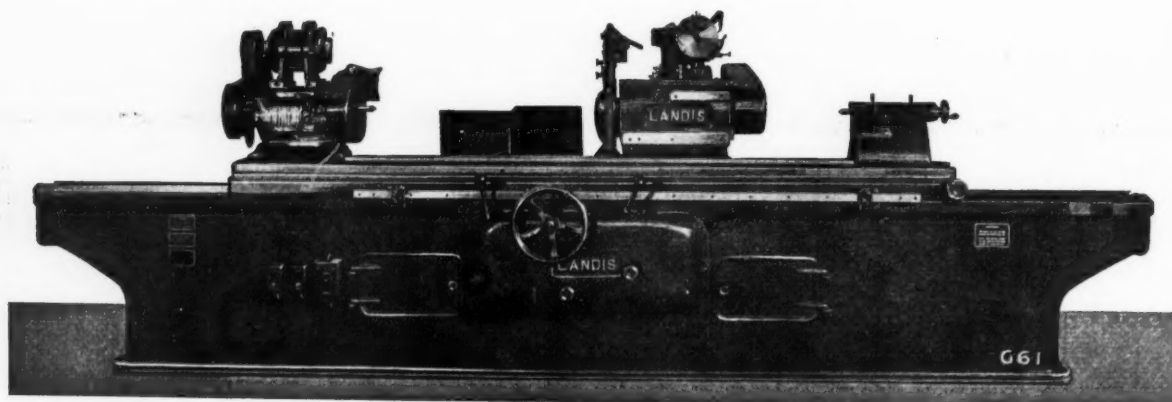
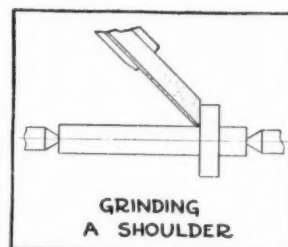
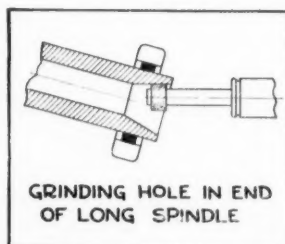
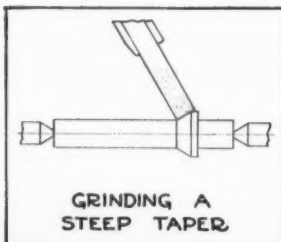
Look around

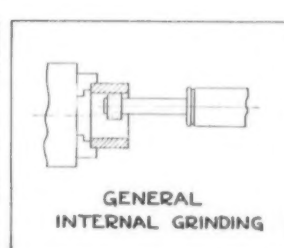
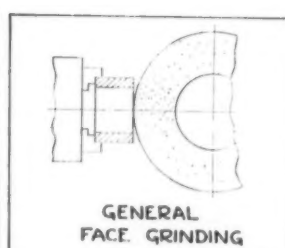
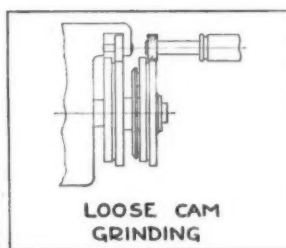
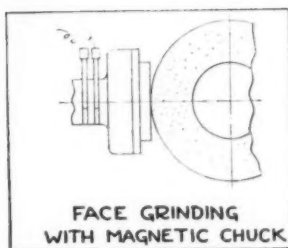
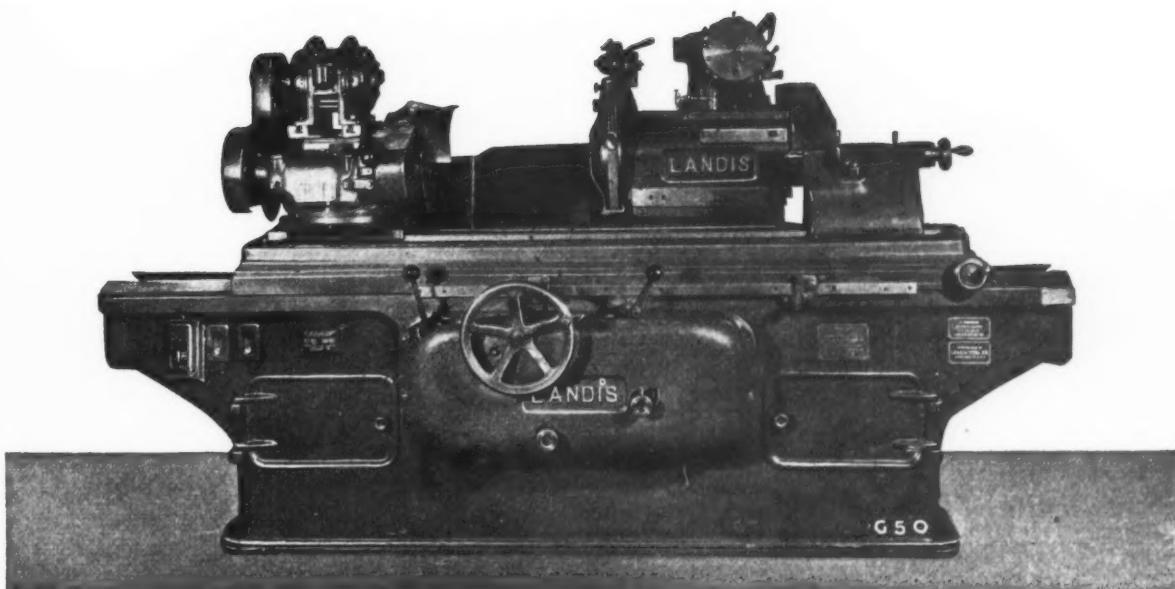
you may find many profitable uses
for a Landis Hydraulic Universal !



Yes, do look around. First in your grinding department. Undoubtedly you will find many grinding operations being performed on machines with universal features. But, are these machines truly productive? Take the grinding of steep tapers, shoulders, holes in the end of long spindles, loose cam grinding, face grinding with magnetic chuck, general face grinding and general internal grinding. These operations and many others of a similar nature represent a class, the grinding of which is frequently slow and costly unless high output justifies the use of single purpose machines.

Look around again. This time in your tool room. Quantities here are, as a rule, much smaller than in your grinding department. Grinder efficiency is often not given the consideration that it is in manufacturing operations. Although the general sharpening of tools is best performed on a Tool and Cutter Grinder, operations such as the grinding of mandrels, boring bars, jig posts and certain dies may be taken care of much faster and better on modern universal machines.





Finally look around in your machine repair department. Again quantities are small. The range of operations performed is great. Grinding equipment must be flexible. Universal machines are ideal, that is, provided they are sufficiently sturdy to turn out work rapidly.

All of the various grinder needs mentioned in the preceding paragraphs point toward the Landis Type C 14" Hydraulic Universals. These machines were designed with the idea of making available fully universal grinding equipment of sufficient weight, range and sturdiness to cause it to produce economically. On the opposite page the 14"x72" size is shown. Above is the 14"x36". Another size in between is the 14"x48". No detail will be gone into here regarding the design features of this new Landis equipment. Catalog No. L-33, which is yours for the asking, does this quite thoroughly.

When, upon looking around your plant, you find need for more efficient universal grinding equipment, it will be necessary to look no further than to the Landis Type C 14" Hydraulic Universals. They certainly are capable of many profitable uses.

LANDIS

TOOL CO. • WAYNESBORO PA

DETROIT • CHICAGO • NEWARK • PHILADELPHIA

163

"PRECISION IN EVERY DETAIL"

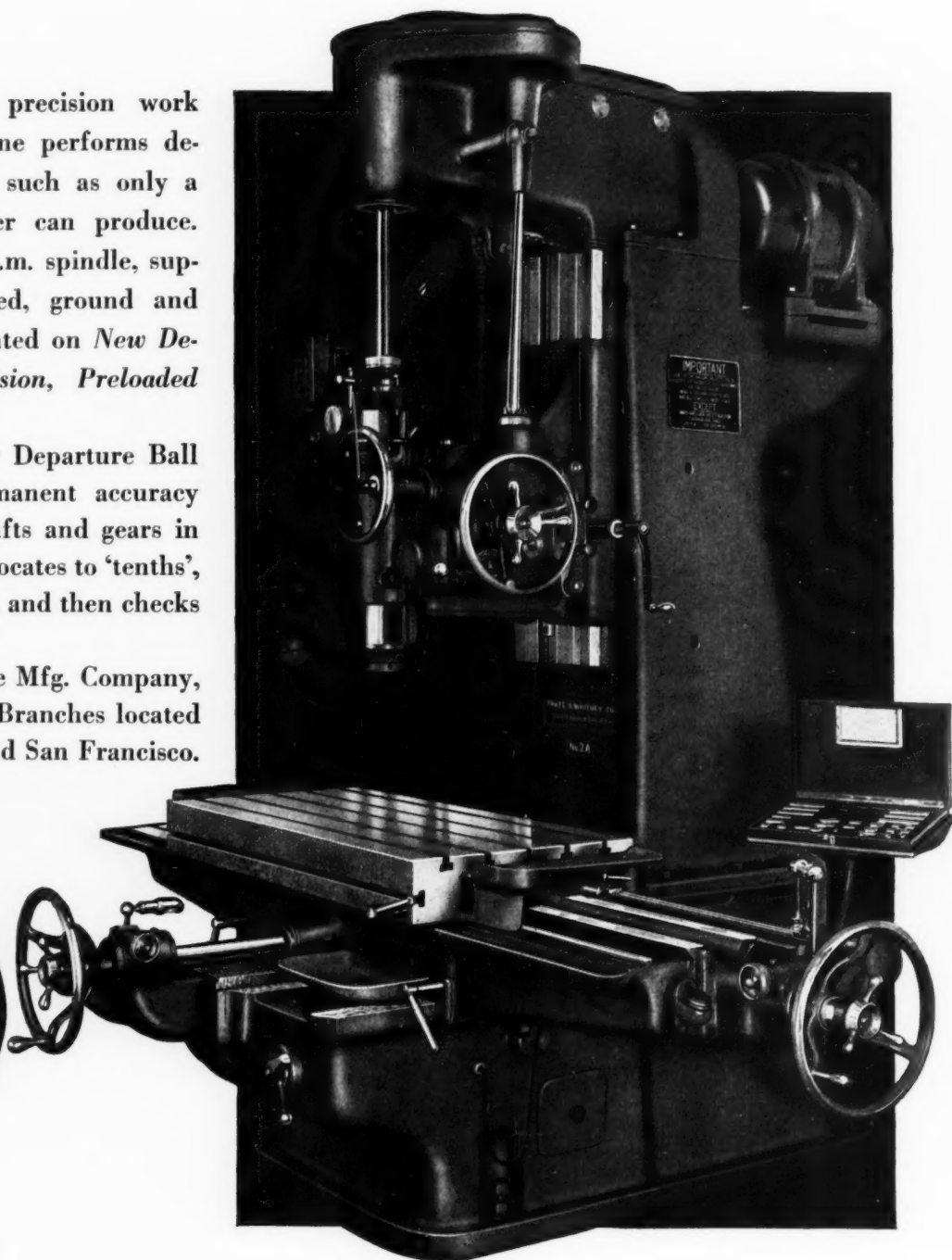
PRATT AND WHITNEY No. 2A JIG BORER

THE high speed precision work which this machine performs demands ball bearings such as only a master bearing maker can produce.

The 37 to 1800 r.p.m. spindle, supported in a hardened, ground and lapped quill, is mounted on *New Departure Ultra - Precision, Preloaded Ball Bearings*.

A total of 25 New Departure Ball Bearings assure permanent accuracy and alignment of shafts and gears in this machine which "locates to 'tenths'", bores where it locates, and then checks its own work."

The New Departure Mfg. Company, Bristol, Connecticut. Branches located at Detroit, Chicago and San Francisco.



WITH

NEW DEPARTURE

ULTRA PRECISION BALL BEARINGS

Cataract

HARDINGE

PRECISION BENCH LATHE AS A BENCH HAND SCREW MACHINE



MODERN HARDINGE "CATARACT" PRECISION BENCH HAND SCREW MACHINE WITH OIL PAN, PIPING AND PUMP

The addition of available attachments converts a Hardinge "Cataract" Bench Lathe into a Bench Hand Screw Machine or vice versa.

Excellent for rapid production of duplicate parts, second operation work, etc. Offered in five sizes— $1/2$ " to 1" collet capacity, 7" and 9" swing, anti-friction or sleeve bearing spindle construction.

Investigate the cost and time saving ability of these units. The extreme accuracy, high spindle speeds and features of operation will prove interesting.

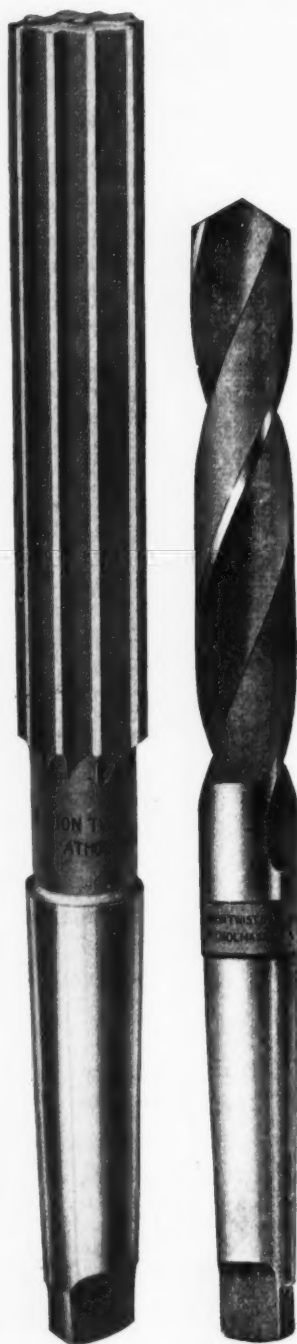
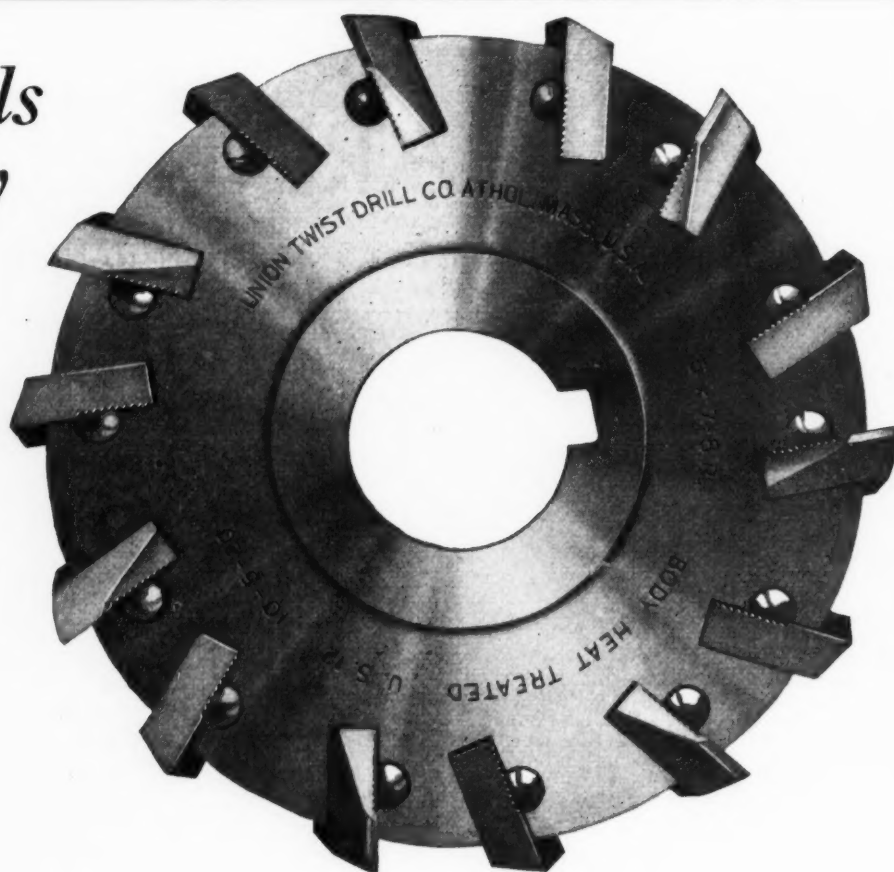
Ask for Bulletin SM

HARDINGE BROTHERS, INC., ELMIRA, N. Y.

CHICAGO — NEW YORK — DETROIT

MACHINERY, August, 1936—19

*"The Tools
You Buy
Again"*



Union Tools carry the nth degree of quality in materials—and craftsmanship in manufacture. That is why, after once using a Tool by Union, you will quite naturally join that vast army of careful buyers to whom the word "Union" means "the Tools You Buy Again."

UNION TWIST DRILL CO. **ATHOL - - - MASS.**

NEW YORK: 61 READE ST.

CHICAGO: 11 SO. CLINTON ST.

LOS ANGELES: 168 SO. CENTRAL AVE.

DETROIT: 6540 ANTOINE ST.

SAN FRANCISCO: 121 SECOND ST.

DERBY LINE, VT.

ROCK ISLAND, QUEBEC

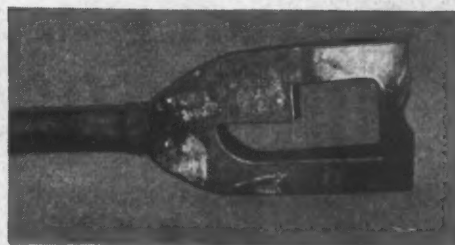
MANSFIELD, MASS.

BUTTERFIELD DIV.

BUTTERFIELD DIV.

S. W. CARD MFG. CO. DIV.

UNION



Diesel marine-engine connecting rod 9 ft. 3 in. long and 16 in. thick cut to shape by the oxy-acetylene process.



Precision cutting to close tolerances becomes possible through the use of precision built machines.

Oxy-Acetylene Cutting effects Tremendous Economies in Shaping Steel

BECAUSE of the new and improved machines developed by Linde, automatic applications of oxy-acetylene cutting are finding increasing opportunities to lower manufacturing costs. Shapes are cut from steel with such speed and precision that, in many plants, designs as well as manufacturing methods have undergone vast changes.

Of the new machines, the Type CM-12 Oxweld Shape Cutting Machine, illustrated, is the most ideally adapted to general use by the heavy industries. The CM-12 reflects the years of experience, engineering and scientific research in oxy-acetylene cutting accumulated by Units of Union Carbide and Carbon Corporation. It includes a number of unusual features never before

provided and permits the widest variety of special cutting operations to be performed.

Let Linde Help You

A Linde representative will be glad to give you complete information about the new CM-12 and to help you adapt oxy-acetylene cutting to your specific steel-shaping requirements. Linde offices are located in principal cities throughout the country. Address the Linde office in your city or The Linde Air Products Company, Unit of Union Carbide and Carbon Corporation, 30 East 42nd Street, New York, N. Y.

Everything for Oxy-Acetylene Welding and Cutting

LINDE OXYGEN • PREST-O-LITE ACETYLENE • OXWELD APPARATUS AND SUPPLIES

FROM



LINDE

UNION CARBIDE



YEAR after year . . . manufacturers of all types of equipment select **FEDERALS**. This continued loyalty proves that performance of **FEDERAL BALL BEARINGS** leaves nothing to be desired under the most difficult load and speed conditions. This consistent performance results from precision—precision in every detail of workmanship, design and material.

THE FEDERAL BEARINGS CO., Inc.
POUGHKEEPSIE, N. Y.

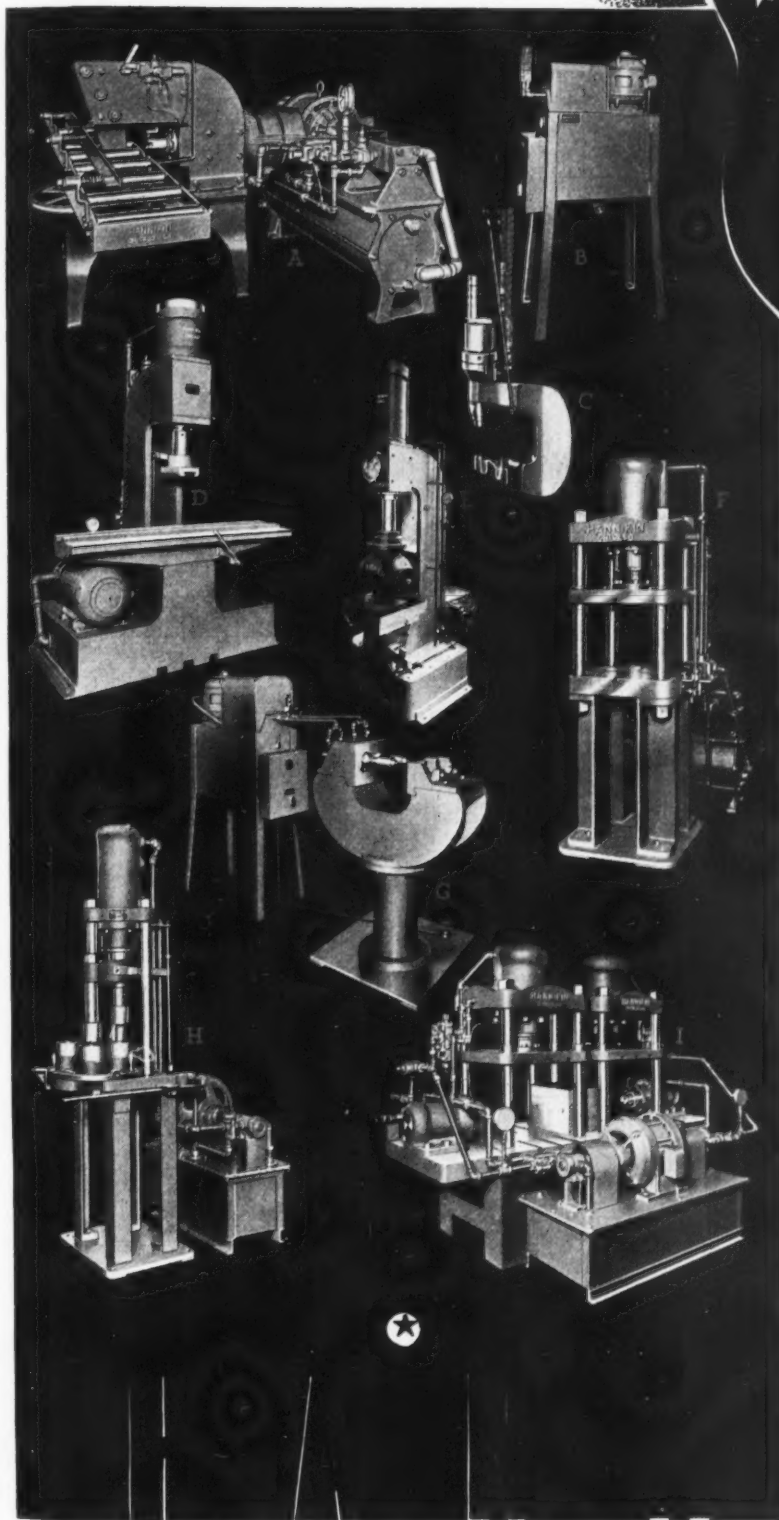
Makers of Fine Ball Bearings

Detroit Sales Office: 2608 Book Tower.
Chicago Sales Office: 120 N. Peoria St.



New ACHIEVEMENTS

★ SPEED
★ CONVENIENCE
★ COST
REDUCTION



THESE Hannifin special hydraulic presses illustrate the diversified range of manufacturing operations where correct application of modern hydraulic power brings remarkable production advantages. Each of these hydraulic units was designed by Hannifin engineers to meet specific manufacturing requirements. Each delivers increased production, simplified handling, and a major cost reduction.

Hannifin engineers are applying hydraulic and pneumatic power and controls to a great variety of production jobs—far beyond the conventional limitations of this type of equipment. Their recommendations on problems of high speed manufacturing or elimination of tedious and costly labor operations are being used by leading manufacturers. Over twenty-six years of specialized experience assure you of authoritative information on the application of hydraulic power to your individual needs. Recommendations will be gladly given upon receipt of your specifications.

- | | |
|--|--|
| A. 50-ton Hydraulic Riveting Machine. | E. 25-ton Hydraulic Testing Machine. |
| B. Automatic Hydraulic Power Unit and | F. 75-ton 4-column Platen Press. |
| C. "Hy-Power" Portable Riveter. | G. "Hy-Power" Special Hydraulic Riveter. |
| D. 35-ton Hydraulic Straightening Press. | H. 3-column Hydraulic Press with Indexing Table. |
| | I. Duplex Hydraulic Press. |

These presses are equipped with built-in hydraulic power units. Many of them can be arranged to operate from central power equally well.

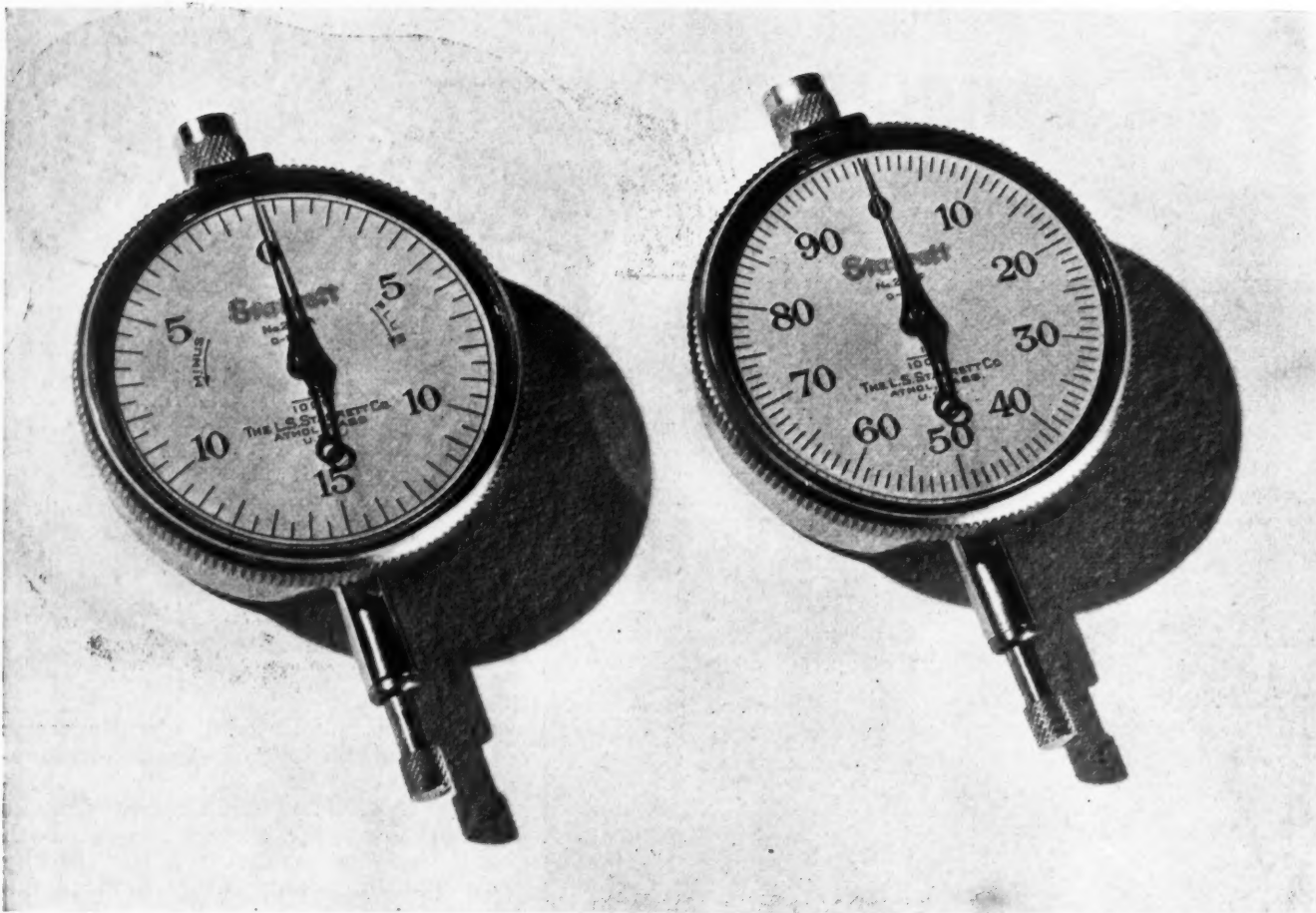
HANNIFIN MANUFACTURING COMPANY
621-631 South Kolmar Avenue • Chicago, Illinois

I F I N

SPECIAL HYDRAULIC EQUIPMENT

ENGINEERS • DESIGNERS • MANUFACTURERS • PNEUMATIC AND HYDRAULIC PRODUCTION TOOL EQUIPMENT

MACHINERY, August, 1936—23



Made to **STARRETT** Standards

THE things you like most about Starrett Tools—their unfailing accuracy, their lasting dependability, their convenient design features—are all just as prominent in Starrett Dial Indicators. They bring the same speed and precision to gaging operations.

Starrett Dial Indicators are made in a complete range of standard sizes and dial arrangements, or special indicators can be developed to fit your particular problems. Jeweled movements, special cut and finished gears and pinions and stainless steel parts make them extremely accurate and durable.

The Special Starrett Dial Indicator Catalog D illustrates and describes the entire line. We will gladly send it on request.

**BUY THROUGH
YOUR DISTRIBUTOR**

THE L. S. STARRETT CO.

*World's Greatest Toolmakers
Manufacturers of Hacksaws Unexcelled
Steel Tapes—Standard for Accuracy
Athol, Mass., U. S. A.*

Starrett

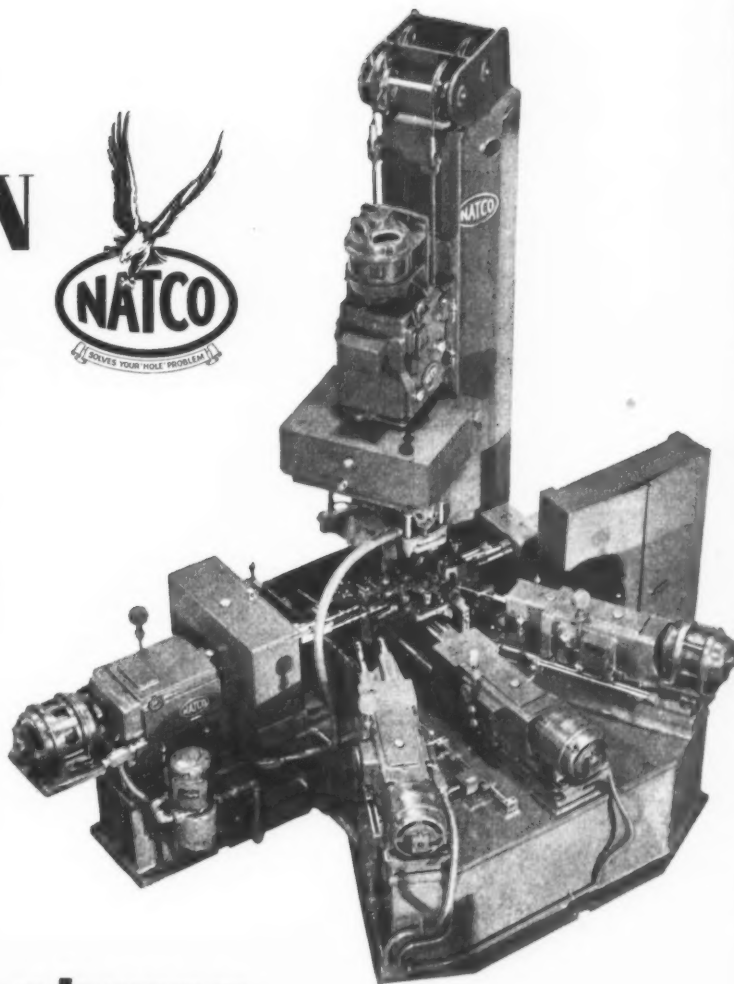
Dial Indicators

MODERN "HOLEUNIT" CONSTRUCTION

● Use NATCO "HOLEUNITS" in building your drilling, boring, and tapping equipment. They make possible the building of highly specialized machines for high production—yet they are standard in every respect. NATCO "HOLEUNITS" are flexible and interchangeable—are completely self-contained and no connections other than electrical are required.

● NATCO "HOLEUNITS" are arranged with a semi-automatic hydraulic feed and will operate mounted at any angle. They may be arranged in groups to perform all the required operations on a casting with a single handling. Should the part for which the units are arranged be altered or discontinued, it is only necessary to rearrange the units, equip them with new spindle boxes and the machine may be used for an entirely different piece of work.

● Illustrated at the right is a six way NATCO machine—distinctly a single purpose machine built to perform a number of drilling and reaming operations on a forged steel crankshaft—yet the machine is built of standard NATCO "HOLEUNITS". Investigate these "HOLEUNITS" today. They are built in a variety of sizes and capacities. Call, write or wire for a NATCO representative today.



Consider the features of the **NATCO** Method of Building Drilling, Boring and Tapping Machines

● Competition is forcing many manufacturers to reduce production costs. Beat competition and lower your costs now. NATCO Engineers will be glad to study your drilling, boring, and tapping problems. Without any sort of obligation on your part we will make a careful survey and lay our recommendations before you—then you

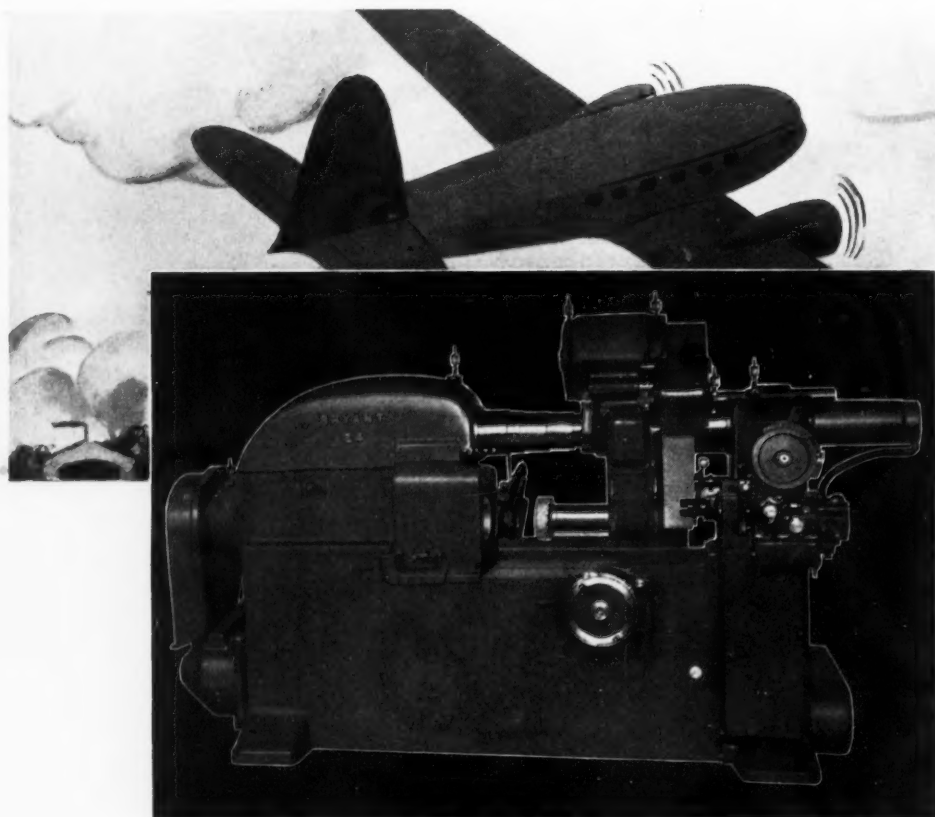
be the judge as to whether they can save you money. Send in your prints or call a NATCO representative today.

● Chicago Office, 2009 Engineering Bldg., 205 W. Wacker Drive. Detroit Office, 409 New Center Bldg. Factory and Home Office, **The National Automatic Tool Co., Richmond, Indiana.**



NATCO

Drilling, Boring
and Tapping Equipment



Hydraulic Deep Hole Grinder



Life and death hang on the smooth unfaltering beat of the airplane's motor. Failure would be fatal. Fine performance depends—as even a passenger knows—on the fact that these engine parts are ground to closer limits, finished with finer surfaces than are even attempted on ordinary work.

For such exacting work engineers prefer Bryant Grinders not only for precision but for ease and simplicity of operation that keep costs where they belong. The No. 24-21" Bryant Hydraulic Grinder is a heavy duty machine, especially designed to grind airplane engine cylinders, sleeves, bushings, bearing rings, large gears and other similar work to close tolerances and mirror finish. A larger size: Bryant No. 24-31" is also available for grinding aviation crank cases, propeller hubs and other close work requiring large diameter swing.

Bryant Chucking Grinder Co.

SPRINGFIELD, VERMONT, U. S. A.

Everything you need

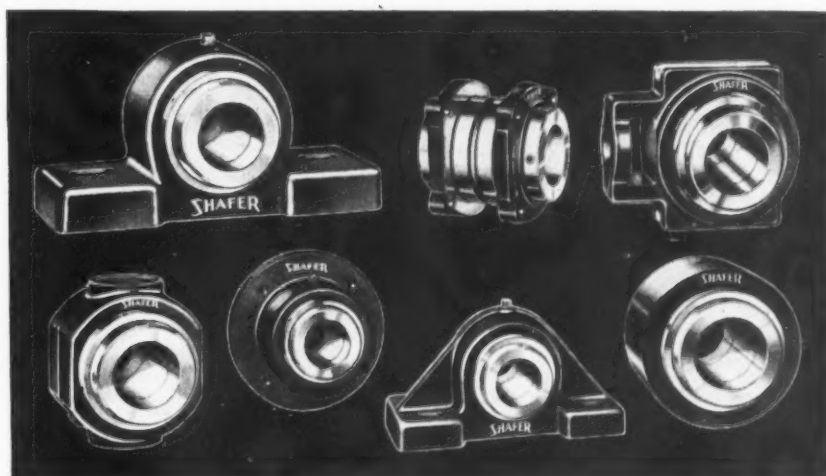
in a **ROLLER BEARING UNIT**

★ The exclusive design of the Shafer Bearing combines every essential performance feature. Shafer Pillow Blocks and other compact roller bearing units are therefore adapted to the widest range of industrial uses.

Only Shafer Bearings combine 1. radial-thrust capacity, 2. integral self-alignment, 3. simple adjustability. Every Shafer Roller Bearing unit provides security against misalignment, shock loads, shaft deflection, or inaccuracies of mounting.

Investigate the extra value and extra performance delivered by Shafer Roller Bearing units. Available in a very complete range of types and sizes—Pillow Blocks, Cartridge Units, Hanger Boxes, Take-up Units, Duplex Units, Flange Units, Conveyor Rolls. Write for catalog 12-A.

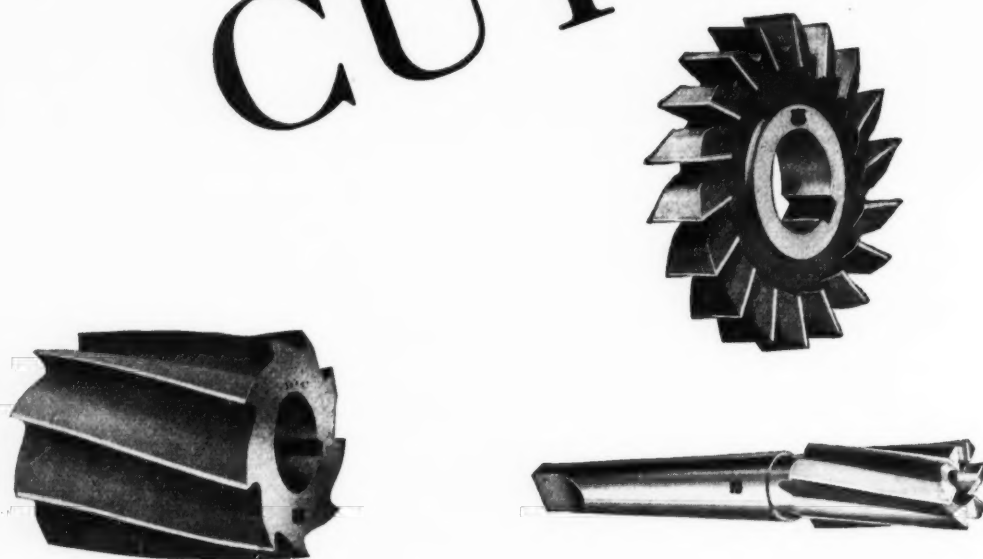
SHAFER BEARING CORPORATION
6519 West Grand Avenue, Chicago, Ill.



SELF-ALIGNING



MILLING CUTTERS



THE STANDARD TOOL Co.

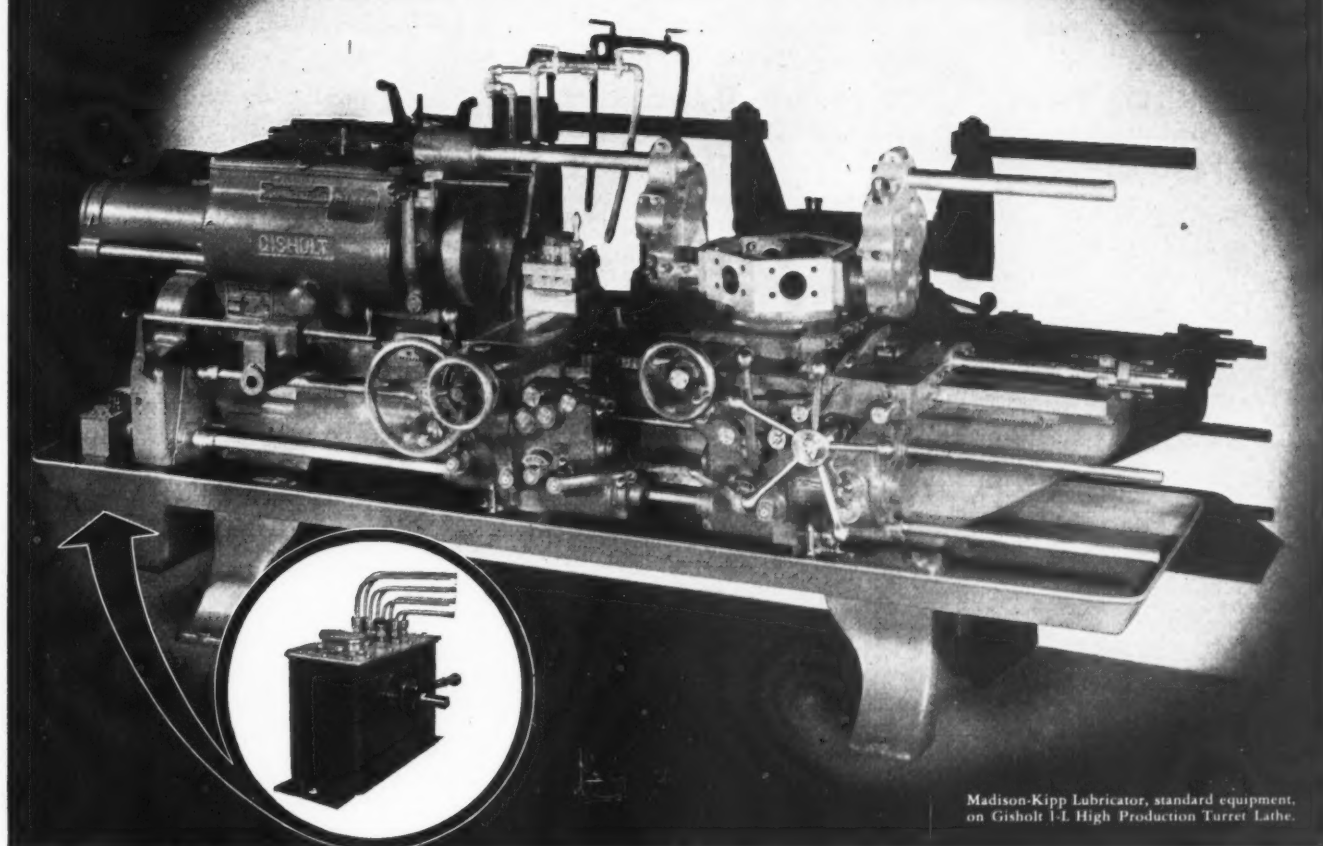
Cleveland

NEW YORK

DETROIT

CHICAGO

MADISON-KIPP - - - FRESH OIL SYSTEMS



Madison-Kipp Lubricator, standard equipment,
on Gisholt 1-L High Production Turret Lathe.

FRESH OIL . . . BY THE DROP from a Madison-Kipp Lubricator is, without question, the most dependable method of lubrication ever developed. The first cost to the machine builder who uses a Madison-Kipp precision metering instrument is higher than he need go if his appeal is to be price alone . . . but the seasoned production executive who buys machines is keen to differentiate between sound engineering and first cost saving. And that's why many of America's highest quality, fast cutting metal and wood-working machines, forming and shearing presses, work engines and compressors continue year after year {10 - 15 - 25 years and longer} to be equipped with one of the many Madison-Kipp Lubricator models. You are invited to send for complete information.

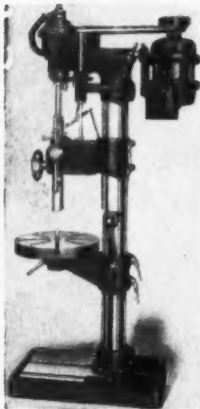
Lubrication Specialists since 1898

Sole Agent in England: W'm. Coulthard & Co. Ltd., Carlisle

MADISON-KIPP CORPORATION
203 WAUBESA ST. MADISON, WISCONSIN U.S.A.

"Buffalo" Precision Drills cost less per hole—because:

"Buffalo" power drills—in every type and size—are designed to accomplish three things: a definite speeding-up of production; stand-up under constant exacting service, and saving in space. Because of large production, they cost less than most tools of comparable quality.



"Buffalo" No. 22 Heavy Duty Drills

Eight-speed drills, with speeds in 1.5 geometrical progression. The speed range provides for efficient use of drills from 3/16 to 2 in., also for tapping and spot facing. A quick shift from direct to back-gear speeds facilitates tapping and reaming.

The entire design enables this type of drill to provide large-size hole capacity, with handling characteristics as fast and smooth as a regular sensitive on light work. The spindle driving quill is mounted in ball bearings in the head, and drives through double keys to equalize the torque. Spindle runs in bronze bushings in the feed rack sleeve, which is provided with ball thrust bearings. The sliding head is a single rigid casting, with quick and easy rack adjustment. Back gears are engaged by a single motion of a handle. All feed gearing is in constant mesh, silent and totally enclosed.

Bulletin 2989

SPECIFICATIONS

Spindle speeds: 65, 96, 150, 2300, 400, 575, 900, 1350 r.p.m.	
Maximum distance, spindle nose to table	27 in.
Range adjustment of table: round column type	19 1/4 in.
pedestal type	14 in.
Range adjustment of sliding head	16 in.
Travel of spindle: with depth stop	7 3/4 in.
without depth stop	9 1/2 in.
Working Surface of table: round column type	19 1/2 in. O.D.
pedestal type	17x22 in.
Least spindle diameter	1.312 in.
Max. distance, spindle nose to base	43 in.
Min. distance, spindle nose to base	28 in.
Motor (1200 r.p.m.)	1, 2, 3, 8 Hp.
Overall height	96 in.
Floor space, including overhangs: round column type	20x44 in.
square column, pedestal type	24x50 in.

"Buffalo" 16-inch Single and Multi-spindle Ball Bearing Drills

Outstanding machine tools, in bench and pedestal types, with one to four spindles, which offer maximum adaptability to varying service conditions. Great flexibility in arrangement is possible through use of interchangeable unit parts with individual motor drive.

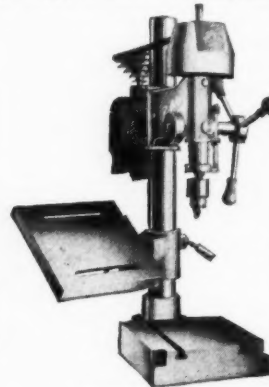
The entire head is standard and used in round column floor type, heavy pedestal type, and bench models. The spindle is carried in a sleeve on two ball thrust bearings, sealed against dust and oil. The design permits exceptional range of feed and travel of both sliding head and spindle. Speed changes quickly and easily made. The spindle is counterbalanced by heavy coil spring, with adjustment to return various weight drills or tapping chucks.



Bulletin 2730

SPECIFICATIONS

Spindle speeds (1725 r.p.m. motor): 400, 600, 1600 and 3000 r.p.m.	
Drills to center of circle	16 in.
Drills holes up to	1 1/4 in.
Tapping capacity	3/4 in.
Least spindle diameter	15/16 in.
Length of feed: without depth stop	7 1/4 in.
with depth stop	5 3/4 in.
Sliding head range	10 in.
Overall height: bench type	56 in.
round column floor type	80 in.
pedestal floor type	82 in.
Overall base and table (combined dimensions)	
Bench Type: One spindle	35x18 in.
Two spindle	35x30 in.
Three spindle	35x42 in.
Four spindle	35x54 in.
Pedestal Type: One spindle	32 9/16x21 3/4 in.
Two spindle	32 9/16x33 3/4 in.
Three spindle	32 9/16x45 3/4 in.
Four spindle	32 9/16x57 3/4 in.



"Buffalo" No. 15 Heavy-duty Production Drills

A metal-working tool specifically built to meet every requirement of high-continuous production—long life, accuracy, high speeds and maximum adjustability to varied operating requirements.

Both bench and pedestals offer five speeds to meet all average requirements for either high or low speed duty—embodying a service range in a single machine that commonly requires two drills. The full speed range is available with quick, easy adjustment, thus equalizing setup costs to short run work where piece prices must be kept as low as for large production.

Feed is by special cut rack and pinion, giving a smooth rolling motion. A quickly-set graduated stop-bar controls depth of feed. Table tilts to any angle, permitting accurately bored holes to be located from 0° to 90°.

Bulletin 2963

SPECIFICATIONS

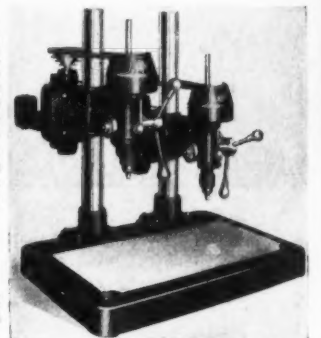
Spindle speeds: 450, 840, 1530, 2700 and 5200 r.p.m.	
Drills holes up to	1 1/2 in.
Drills to center of circle	15 1/4 in.
Feed travel	4 1/2 in.
Spindle travel	17 in.
Spindle diameter	3/4 in.
Geared chuck capacity	1 1/2 in.
Max. distance, table to chuck: Bench type	12 in.
Pedestal type	42 in.
Working surface of table	10x11 in.
Overall height: Bench type	38 in.
Pedestal type	70 in.

"Buffalo" Twin 15" Bench Drill

This is a high-class substantial machine in every respect—in fact, it is identical with the popular Buffalo No. 15 Drill—except that it's twins! You get five speeds on each drill—full ball bearing spindles, three spoke feed wheels for quick feeding, graduated quick set stop-bars for feeding to required depth in repeat work, V-belt drive, in fact, you get everything which has made the No. 15 the largest selling drill we manufacture.

SPECIFICATIONS

Two spindles—mounted on table.	
Drill holes up to 1/2 in.	
Drill to center of 15 1/4 in. circle.	
Five speeds—5200, 2700, 1530, 840, and 450 r.p.m. (or any combination you want).	
Maximum height of spindles, raised 38 in.	
Maximum distance, chuck noses to base 17 in.	
Shipping weight, without motors, 305 lbs.	



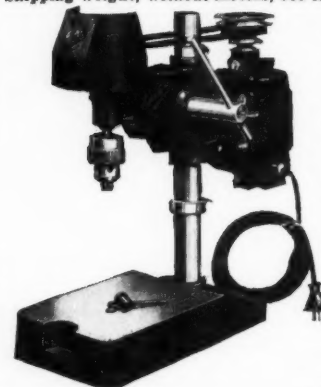
Bulletin 2986

Buffalo No. 13 Simplex Drill

The modern machine—bench type only—for small jig and fixture work, boring, tapping, counter-sinking and bench assembly drilling. Probably the lowest-cost sensitive bench drill, and a great favorite for battery operation on shift duty on continuous production machining lines.

The entire drill head travels up and down the column with ease. The spindle, which is stationary and forms part of the head, is mounted on two radial thrust ball bearings and adjustable for wear. Head may be swung around at any angle. An important feature is the 4-step sheave pulley with V-belt, giving tremendous pulling power without slip at all speeds.

Standard motor bracket is universal and will take most makes of small motors. Grinding, tapping and flexible shaft attachments available.




Bulletin 2844

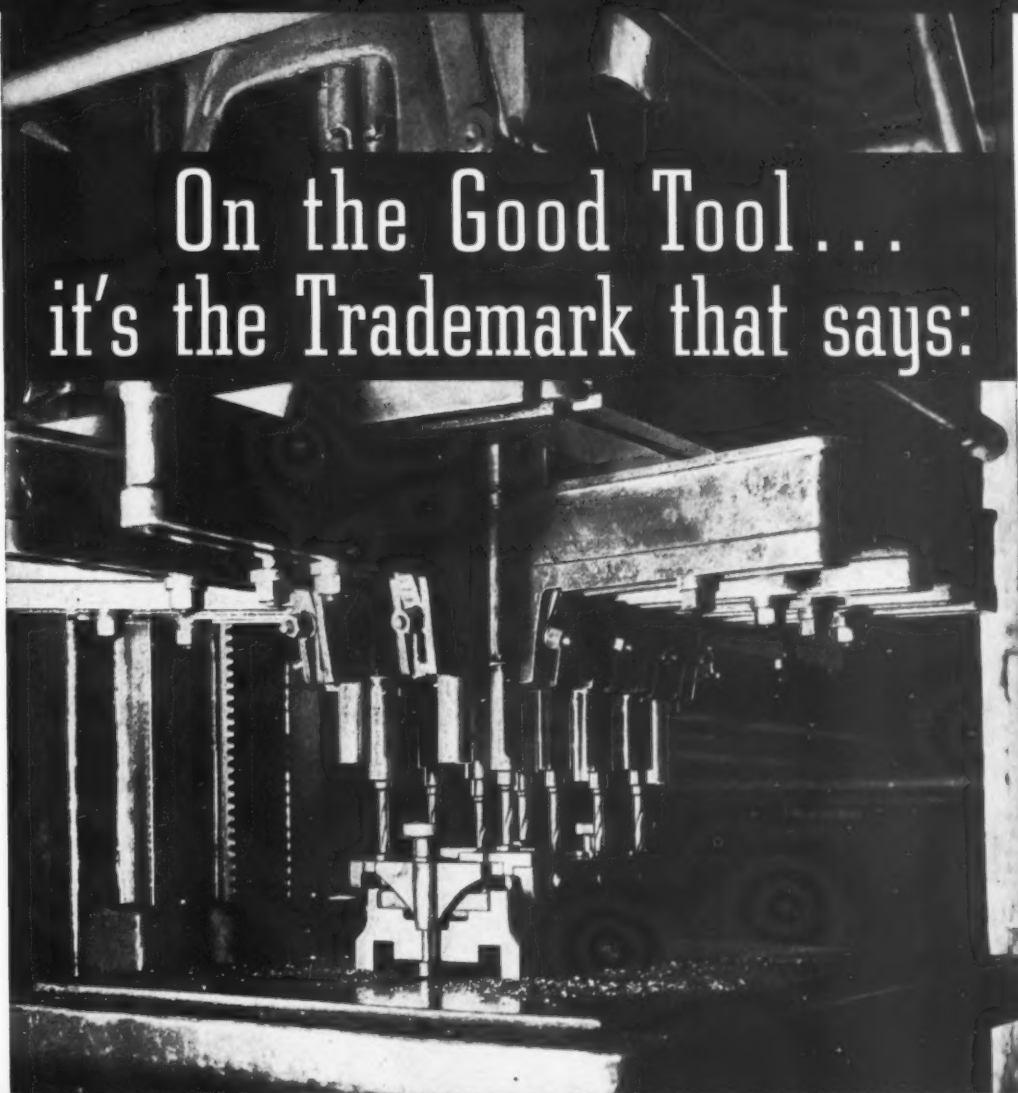
SPECIFICATIONS

Spindle speeds, 855, 1210, 2380 and 3400 r.p.m.	
Feed travel	9 in.
Drills to center of circle	13 1/4 in.
Drills holes up to	1 1/4 in.
Max. distance, chuck nose to base	9 1/4 in.
Power required (at 1750 r.p.m.)	1 1/4 in.
Overall height	23 in.
Bench space	10x22 in.

"Buffalo" Forge Company, 440 Broadway, Buffalo, N. Y.



On the Good Tool...
it's the Trademark that says:



"HERE I AM - COME AGAIN"

★ A great majority of companies report that they purchase drills and reamers by trade name or brand because it guarantees the excellence of the tools.

The familiar "Diamond C" emblem on the shanks of all "Cleveland" Tools delivers a message about good tools that might well read "Here I am—come again." And a great proportion of tool users in the country's greatest industries *do* "come again" to "Cleveland." Repeat orders keep the "Cleveland" business growing;—in a recent "blind" test, "Cleveland" received users' voluntary preference in the ratio of nearly 5 to 1.

Feel free to call upon "Cleveland" Distributors everywhere—or any of our four Stockrooms—or the Home Office—for assistance on any particular problem of drilling or reaming. And let the "Diamond C" trade mark help to guide your future ordering.

The **CLEVELAND** **TWIST DRILL COMPANY**
TRADE MARK REG. U. S. PAT. OFF. AND FOREIGN COUNTRIES
1242 EAST 49th STREET
CLEVELAND

30 READE ST. NEW YORK	9 NORTH JEFFERSON ST. CHICAGO	654 HOWARD ST. SAN FRANCISCO
6515 SECOND BLVD., DETROIT	LONDON - E. P. BARRUS, LTD.	35-36-37 UPPER THAMES ST., E.C.4

"CLEVELAND" DISTRIBUTORS EVERYWHERE ARE READY TO SERVE YOU

Without disturbing production schedules YOU CAN EFFECT THIS ASSEMBLY MODERNIZATION



THERE is no need for most production officials to wait for a slack period, or until a new model is designed, to put into effect the modern, simplified method of assembly offered by Parker-Kalon Hardened Self-tapping Screws. Practically speaking, a change from the comparatively complicated and costly practise required by common fastening devices to the time-labor-money saving Self-tapping Screws can be made overnight.

So adaptable are these famous Screws to all kinds of metal and plastic assemblies that usually it is only necessary to substitute them for machine screws, bolts and nuts, rivets, etc. Designs need not be changed. Special tools are not required. Skill is not necessary. With a few moments instruction any operator can make perfect fastenings.

*Use this specialized knowledge
to determine what you can gain*

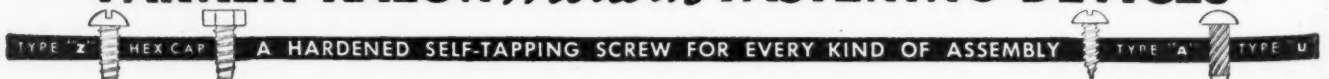
Right now your assembly work probably holds

worthwhile opportunities for using Self-tapping Screws to make better, stronger fastenings at lower cost. It will pay you to hunt them out. And it is easy to do . . . if you use the specialized knowledge of Parker-Kalon Assembly Engineers.

Your invitation will bring one of these Engineers to go over your fastening jobs with you. He will offer no "cure-all". A background of practical assembly work fits him to render intelligent aid. And his specialized knowledge enables him to recognize the many different types of assemblies which Hardened Self-tapping Screws WILL make better and cheaper. Because in 7 out of 10 cases he has helped production and design men to obtain desirable benefits, there is an excellent chance that he can help you, too.

PARKER-KALON CORPORATION
202 Varick Street New York, N. Y.

PARKER-KALON *Modern* FASTENING DEVICES



IF YOU CAN AFFORD TO IGNORE ECONOMY...

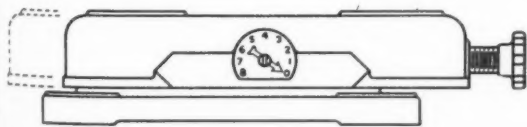
...then ignore this page!

To produce different products on the same machine, different speeds are required. Different speeds have required different drives, and the cost and delay of dismantling the old and buying and installing the new.

The Vari-Pitch Sheave, for Texrope V-Belt Drives, obsoletes all such procedure and its attendant expense and loss of time. This vitally important new development in power transmission permits, through a simple adjustment that takes but a few moments, a variation in speed of from 15 to 25% per sheave, and the minutest control of the variation within that range.

That means you can make a variety of different products on the same machines, some of which may require a higher speed, some a lower; and you can experiment with different speeds to see at just what speeds your machinery develops the highest efficiency.

Vari-Pitch Texrope Sheaves are made for stationary and motion control.



Straitle Automatic Ball-Bearing Motor Base developed for the motion control Vari-Pitch Sheave. You simply turn the hand wheel to alter the diameter of the sheave and simultaneously the base moves forward or backward to maintain proper belt tension. Write for Vari-Pitch Bulletin No. 1261.

Belts by Goodrich



Vari-Pitch Sheave adjusted for maximum diameter-high speed.

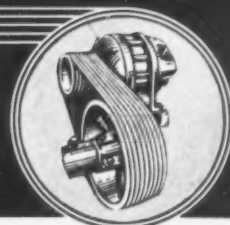


Vari-Pitch Sheave adjusted for minimum diameter-low speed.

15% TO 25% VARIATION IN SPEED

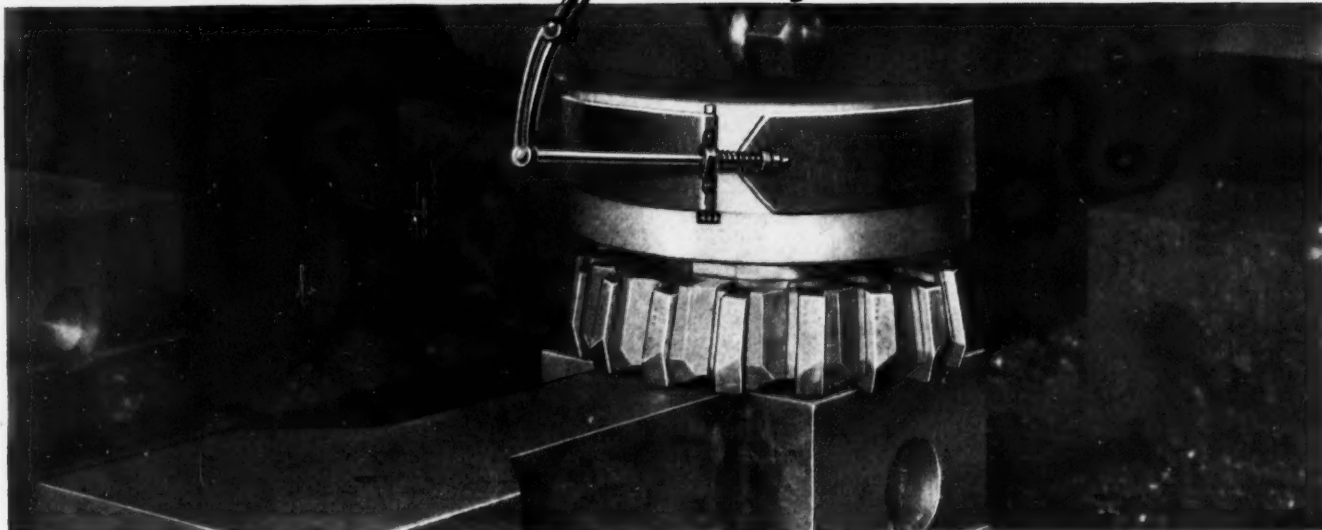


TEXROPE DIVISION
ALLIS-CHALMERS



M I L W A U K E E W I S C O N S I N

Take the **BRAKES** **OFF** your Machine Tools



... and Get a **FULL MARGIN** of **PROFIT!**

Can your machines go faster? Then use Carboloy! Greater speed means more production. More production means greater profits. Take the brakes off your machine tools and get a full margin of profit by using Carboloy!

Here's the average increased speed on 100 jobs after applying Carboloy tools: Cast iron 153%! Aluminum Alloy 238%! Brass, bronze and copper 297%! Non-metallics 175%!

Whether it's boring, facing, turning, milling, reaming, spot-facing or any other common machining operation—you'll find Carboloy tools will do the job faster and give you a greater margin of profit! Ask for 28-page booklet "SC-35" which shows how to get those greater profits!



CARBOLOY COMPANY, INC.

2987 East Jefferson Ave. Detroit, Michigan

Chicago • Cleveland • Newark • Philadelphia • Pittsburgh

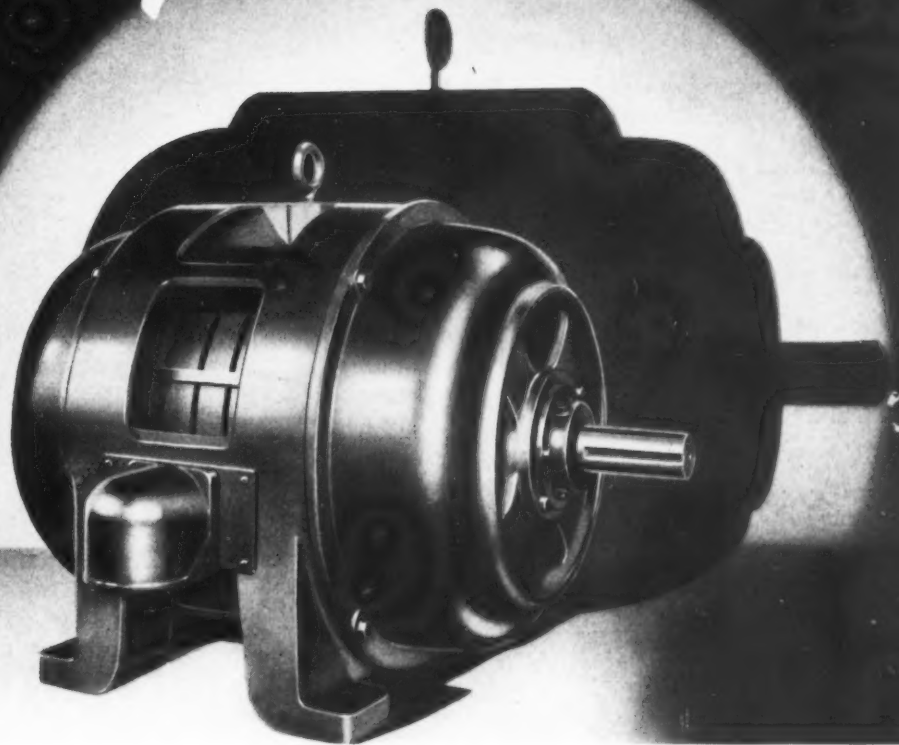
Get a Full Margin
of Profit from your
Machine Tools, with

CARBOLOY

**CEMENTED
CARBIDES**

REG. U.S. PAT. OFF.

LITTLE THINGS MAKE A *Great* MOTOR



...AND F-M MOTORS HAVE THEM ALL!

NEARLY anyone *could* make a motor. The fundamentals of motor design are in the textbooks of every engineering school. But more than fundamentals are required.

It's the *little* things gleaned from long engineering experience that make a *great* motor! The little things like one-piece phase group windings that have no soldered leads to melt out . . . self-locking cuff insulation to prevent slippage and protect windings under severe service . . . sealed-in leads that can't pull out or short under strain

in installation or operation . . . dynamic rotor balancing and vibrometer tests for smooth running.

You'll find all these little *big* things that make for longer motor life and more successful performance in Fairbanks-Morse motors. The little *big* things that give you more for your money every time. Before you buy, investigate what extra advantages F-M motors can give you. Address Department K471, Fairbanks, Morse & Co., 900 S. Wabash Ave., Chicago, Illinois. 34 branches at your service throughout the United States.

601 EA40, 36

106


YEARS OF
PRECISION
MANUFACTURING

FAIRBANKS - MORSE

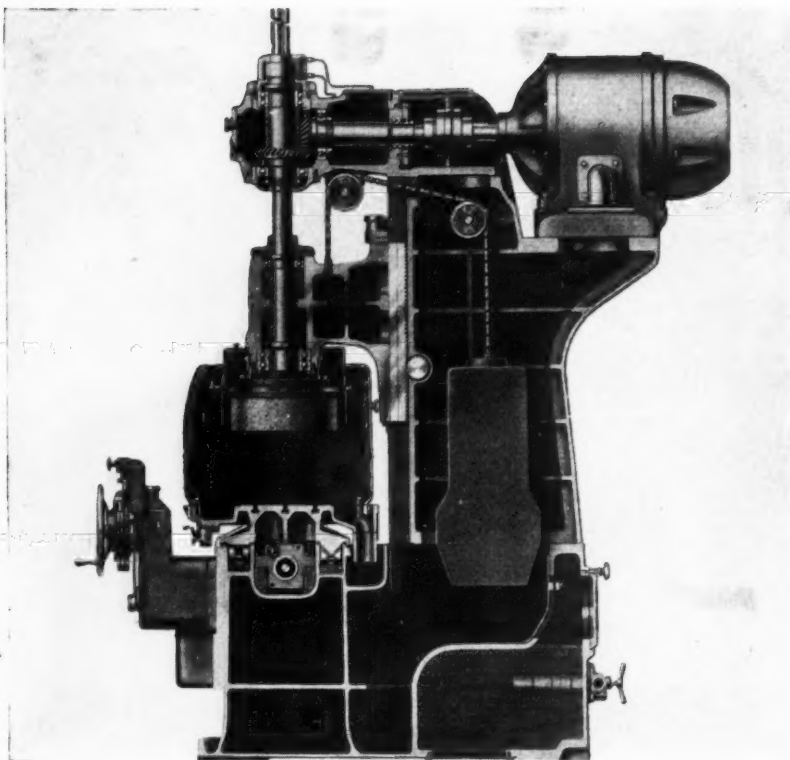
Motors



POWER, PUMPING AND WEIGHING EQUIPMENT



SKF-EQUIPPED
BUILT BY
PRATT & WHITNEY CO.



FOR SMOOTH GRINDING **SKF** MEET ALL DEMANDS

Successful surface grinding requires the right table speeds . . . and the right bearings . . . for each job. And while this 14" Hydraulic Vertical Surface Grinder maintains "exactly the right speed for roughing or finishing any job," **SKF** Bearings keep precision tolerances on the spindle.

Whether the table power feed runs from 0 to 100 feet per minute, or the vertical power feed with each end table stroke .00025" to .005", **SKF** assure accurate alignment of the wheel head. Whenever **SKF** Bearings are used, bearing inaccuracies and adjustments are banished forever, and there is practically no wear. Send for our catalog, "Smooth Grinding with **SKF** Bearings."

SKF INDUSTRIES, INC., FRONT ST. & ERIE AVE., PHILA., PA.

3658



SKF
BALL & ROLLER BEARINGS

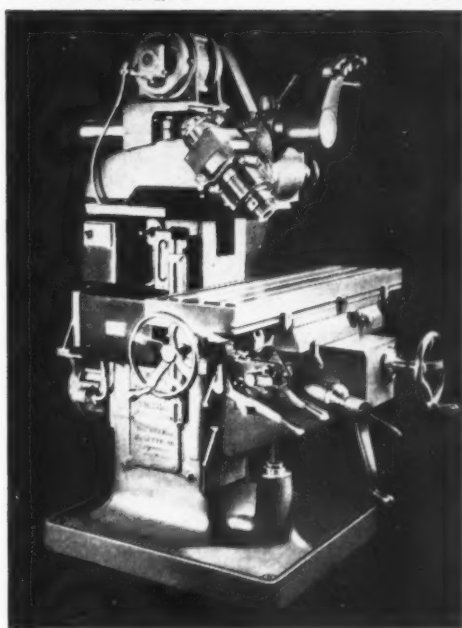
"The way to promotion and pay"



MOOSE Mackie used to be a loafer—not by nature—but because he ran a milling machine that often stood idle, waiting for work. Not much money in a situation like that—for anyone!

Moose and his foreman put their heads together. Then, well fortified with cost estimates, they went after the boss. Now Moose is running a new Van Norman 22, keeps busy all day long, finishes most milling jobs in one set-up. Costs are down, profits up—and he has earned a share of them.

If YOU have a problem in toolroom, contract, pattern, experimental, or short-run production work, there's some information we can give you, on one of the four sizes of Van Norman Universal Millers. Just say the word.



WORK-RANGE OF VAN NORMAN UNIVERSAL MILLERS

NUMBER 6

Table Size30x6 $\frac{7}{8}$ "
Feed Range18x5 $\frac{3}{4}$ x6 $\frac{1}{4}$ "
Ram Movement.....9 $\frac{1}{2}$ "

NUMBER 12

Table Size37x8 $\frac{1}{8}$ "
Feed Range17x6 $\frac{5}{8}$ x17"
Ram Movement.....10"

NUMBER 22

Table Size45x11 $\frac{5}{8}$ "
Feed Range27 $\frac{1}{2}$ x11x17 $\frac{1}{2}$ "
Ram Movement.....19"

NUMBER 32

Table Size55x12"
Feed Range34x10 $\frac{1}{8}$ x22 $\frac{1}{4}$ "
Ram Movement.....19"

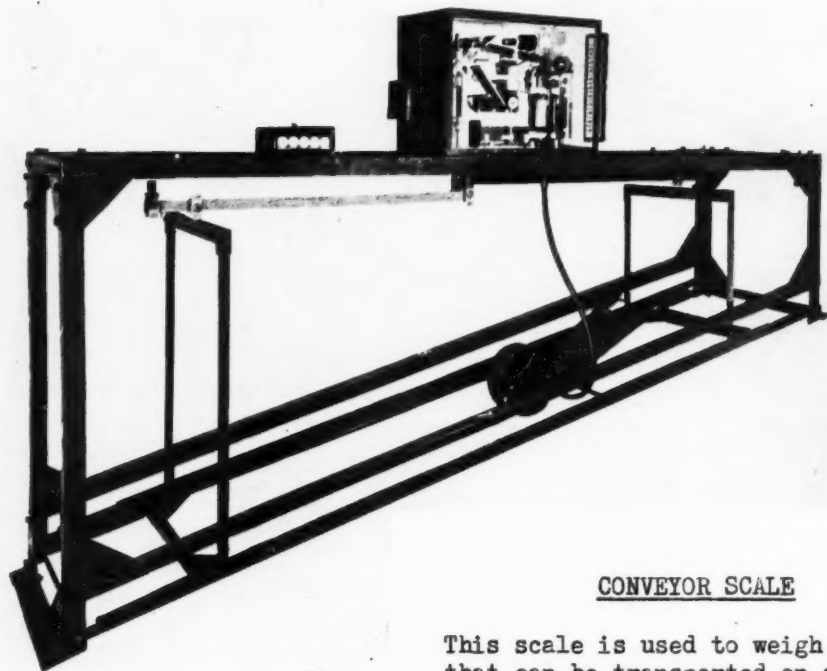
VAN NORMAN

VAN NORMAN MACHINE TOOL CO., SPRINGFIELD, MASSACHUSETTS

MACHINERY, August, 1936—37

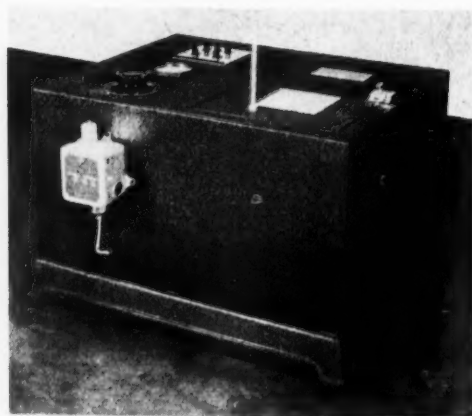
BULLETIN BOARD S.S.WHITE FLEXIBLE SHAFTS

- August 1936 -



CONVEYOR SCALE

This scale is used to weigh anything that can be transported on a conveyor belt. Conveyor belt operates the traction roller. This roller in turn, through an S. S. WHITE flexible shaft, drives the electrically connected rotary cam and contact drum in the recording part of the scale, in correct speed ratio to the conveyor belt. The scale is a product of John Chatillon & Sons, New York City.



OIL CLASSIFYING
DEVICE

The Adher-O-Scope is used for classifying oils by measuring the adhesion of the oil to metals. The tachometer on the side of the device is operated by means of an S. S. WHITE flexible shaft to avoid vibration which would result from a rigid drive if not perfectly aligned. Adher-O-Scope is made by Sperry Products, Inc., of Brooklyn, N. Y.

*Would you like
to have copies of
previous bulletins
showing other power
drive and remote
control applications?
We'll be glad to send
them on request.*

The S.S.WHITE Dental Mfg. Co. INDUSTRIAL DIVISION
10 EAST 40th. ST. ROOM 2310 M, NEW YORK, N.Y.

PLACE the BLAME WHERE IT BELONGS



● "Good workman" says his foreman. "Dependable" says his record through the years. Yet his production is far from good.

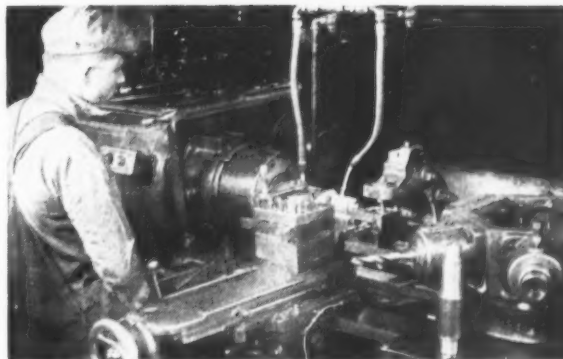
But before you blame the man, study the machine he's operating. Is it worn out? Has it the stamina to speed up production by using modern cutting tools? Is it slow in handling? Is it hard to work to the required tolerances?

These are only a few of the things that slow up good operators—and add to your costs. The machines may look all right, may be in good condition, yet their lack of performance may penalize you.

Finding these shirkers among your machines is the business of Gisholt Engineers. They're doing it every day in the year—many times in shops where no one suspected the equipment was at fault. Here, for instance, is a typical case where the late model Gisholt reduced machining time by more than 60%. ●

But you can expect more than just lower costs from Gisholt Turret Lathes. They'll help you make a better product—they'll step up production without adding floor space—they stay on the job—they help you get the utmost from your operators. Gisholt Engineers will be glad to survey your shop, study your production requirements and show you what profits the new Gisholts will produce for you. There's no obligation in asking for this service.

GISHOLT MACHINE COMPANY
1209 EAST WASHINGTON AVENUE, MADISON, WISCONSIN, U.S.A.



This job was typical of many we encounter. It is a low-speed pinion for a gear train. Previous time 45 minutes to turn for grinding, center one end, and cut off. Not so bad, perhaps, considering the material is 3" bar stock of chrome-nickel steel with a hardness test of 400 Brinell. But it was apparent to the Gisholt Engineer that it could be done in less time. The result was the installation of a Gisholt 2L High Production Turret Lathe which handles the job now in 13 minutes—less than one-third the former time. May we help you?

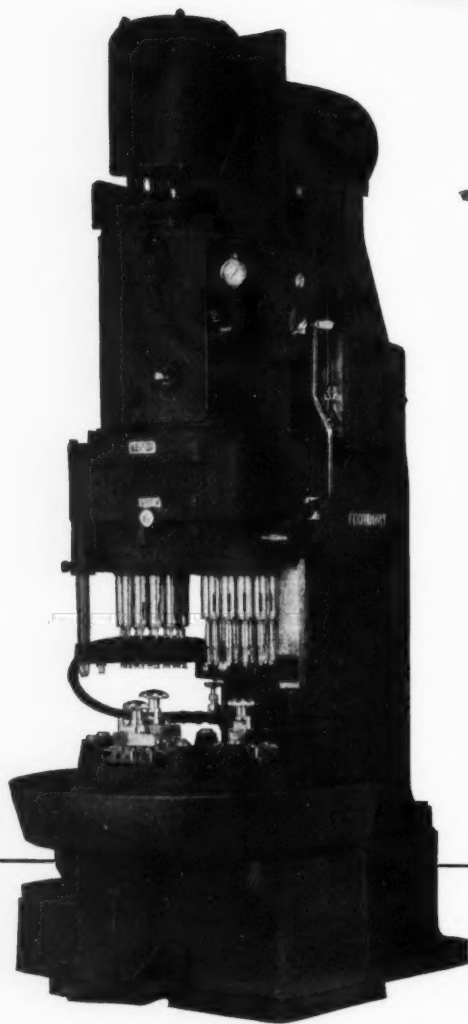
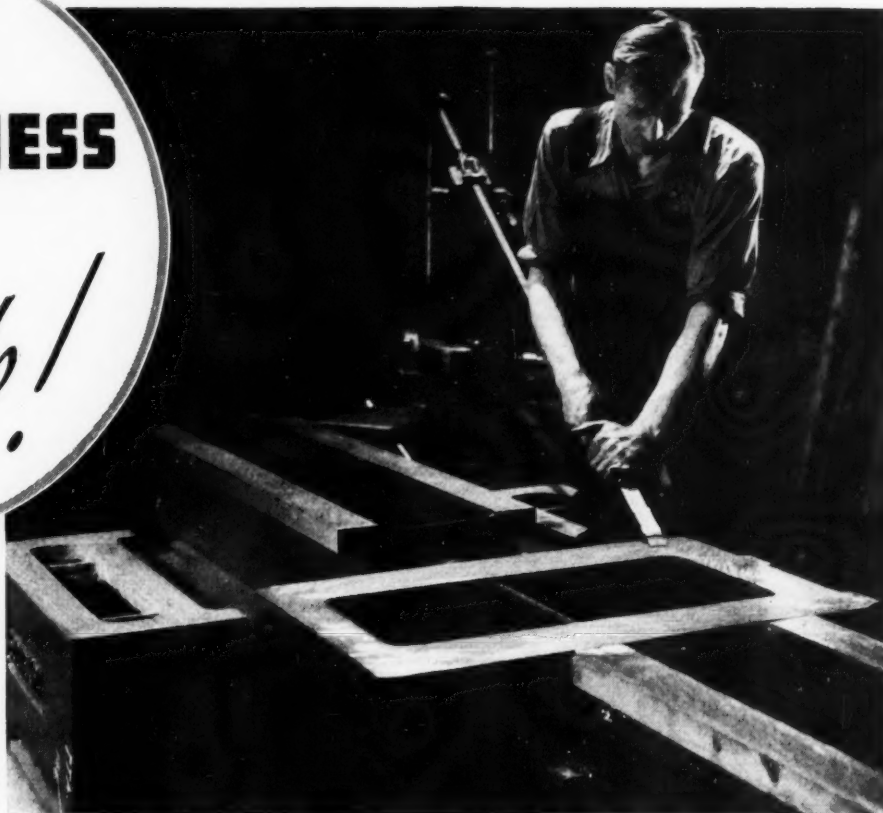


GISHOLT TURRET LATHES

THOROUGHNESS

IN

Details!



CARE and thoroughness with individual parts means speed and accuracy in the final assembly of machine tools. The entire "Footburt" organization is geared up to handle orders promptly... for a small sensitive drill or a complete line-up of special equipment. We will be glad to figure with you on your requirements for drilling, boring, reaming, tapping and surface broaching machines.

THE FOOTE-BURT COMPANY

CLEVELAND, OHIO

Detroit Office:
4-151 General Motors Bldg.

Chicago Office:
525 Washington Blvd.

FOOTBURT

One-way drill with large hydraulic feed unit for drilling and counterboring twelve holes in two operations. Three other sizes available with varied capacities.



KH2

GEOMETRIC *DIE HEADS*

For Hand Operated Machines

A remarkably compact, extremely accurate Stationary Self-Opening Die Head—one of our important K Line Threading Tools—a companion to the K D Rotary Die Head with chasers completely interchangeable with all other K Line Die Heads.

Among outstanding features are utmost simplicity of design, smooth and positive locking, buffer or cushion action and the careful accuracy of all working parts.

Close - to - shoulder threading, rigid chaser support, quick chaser removal, easy, accurate, positive adjustment for size without the use of tools—all contribute to the high degree of threading efficiency of the K H 2 and all other Geometric K Line Die Heads.

Send for details of this tool and the rest of the K Line. Ask for a complete list of the large efficient line of Geometric Taps, Die Heads and Threading Machines.

THE GEOMETRIC TOOL CO.

New Haven, Conn., U. S. A.

BAKER MEETS



PRODUCTION DEMANDS of Economy, Speed and Accuracy

Baker machines for 59 years have led industrial progress. Now, whatever your drilling, boring, or tapping requirements, a modern Baker machine is a wise investment.

Where production efficiency is most demanded, where time and costs are most carefully studied, our machines are in service. The largest automotive plants, the largest electrical plants, the

largest agricultural implement plants are using our equipment. Where performance is constantly checked, Baker machines prove themselves real dividend payers.

Let us check blueprints or a sample. Our prompt recommendation may show you the way to definite savings. Baker Brothers, Incorporated, Toledo, Ohio.

MODERN DRILLING, BORING AND TAPPING EQUIPMENT

★ BAKER ★

Save Over \$200

—on initial cost alone!

R RIGHT **AND** **L** LEFT

The R and L Tool is a new, single tool, complete in itself. It does the work quicker and with considerably less manipulation. The result is—less time, less cost... more production, more profit.

As a Turning Tool, the R and L Combination Tool produces a highly polished surface, true to size and straight.

As a Burnisher, the extremely hard surfaces of the Tantalum

Carbide backrests prevent the pick up of metal. The surface of the work cannot be marred with scratches or blisters.

The R and L Tool is quickly converted into a Balanced Turning Tool with two cutting edges and, as such, is particularly adaptable to quick, rough cutting.

Drilling, with an unusual degree of accuracy, can be accomplished while turning. Perfect concentricity and centering is assured.

The R and L Tool is a tremendous convenience on multiple spindle machines where, ordinarily, the lack of sufficient space would necessitate additional operations.

Thus, at least seven tools are replaced—to a greater advantage—with this new R and L Tool. Where previously a Roller Bar Tool, a Centering and Facing Tool, a Knee Tool, a Pointing Tool, a Backrest, a Floating Drill Holder and a Balanced Turning Tool were needed, now the new R and L Tool suffices! The same R and L Tool also replaces the old left-hand set of tools...

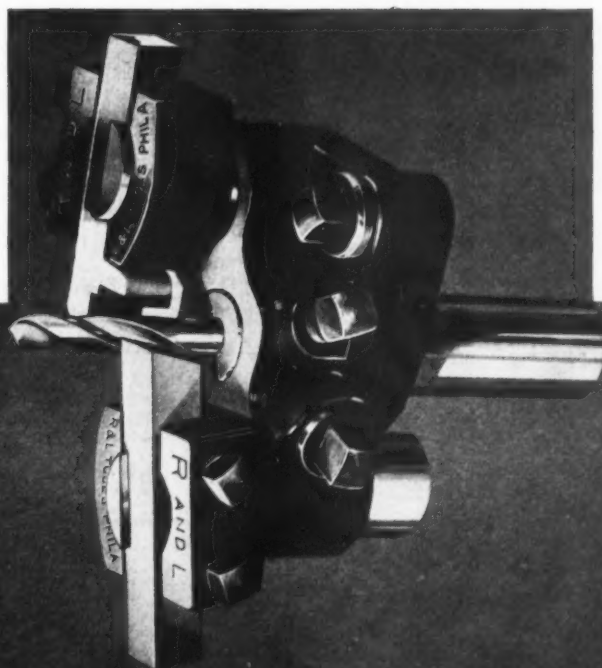
thus, close to \$300 in tools is replaced by a more efficient, more modern tool for only

\$65.

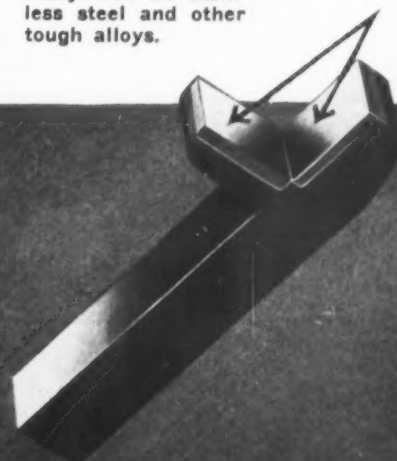
Investigate! Write for literature and check up on the claims for this time-saving, money-saving R and L Tool!

R AND L TOOLS
Nicetown, Philadelphia, Pa.

The large illustration at the right shows the R and L Turning Tool set for Drilling and Turning at one operation. Note the ample room for chip clearance. The illustration immediately below shows the Tool set as a Balanced Turning Tool with one cutter set in advance of the other, turning two diameters.



Tantalum Carbide Faces on the R and L Backrest act as a burnisher, making it impossible to pick up metal and mar the surface of the work with scratches or blisters. This replaces Rollers and Roller Shafts, avoiding misalignment due to Roller wear, and works especially well on stainless steel and other tough alloys.





... the basis of your saving

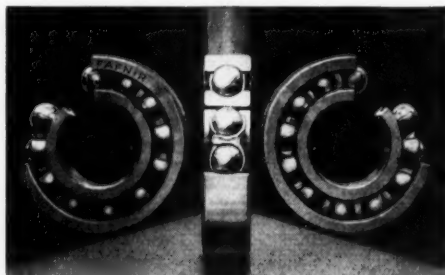
Forging the rings that later become raceways, from carefully selected bars of specially developed steel, is the foundation of the long, friction-free life which Fafnir Ball Bearings provide. The marked improvement in grain structure gained by this forging operation is just one of the hidden factors that contribute to the long-wearing, stress- and strain-proof performance that characterizes Fafnirs.

Such qualities pay greater and greater dividends as time goes

on. Extreme accuracy and long life are direct results.

There is a Fafnir Ball Bearing that exactly fills every requirement. Backed by the most complete line of types and sizes in America, Fafnir engineers can always help you select the bearing best suited to *your* needs. . . . The Fafnir Bearing Company,

New Britain, Connecticut . . .
Atlanta . . . Chicago . . . Cleve-
land . . . Dallas . . . Detroit . . .
Kansas City, Mo. . . Milwaukee
. . . Minneapolis . . . New York
. . . Philadelphia.

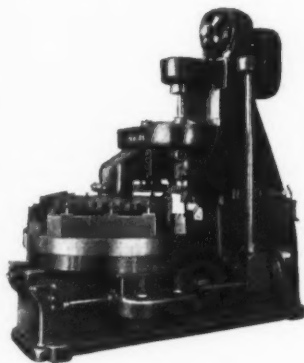


Forging is one of the 77 operations in the manufacture of a Fafnir Ball Bearing, of which this Single Row Bearing is a representative type.

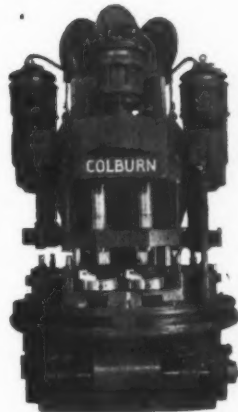
 **FAFNIR** 
B A L L B E A R I N G S

CONSOLIDATED MACHINE TOOLS ARE

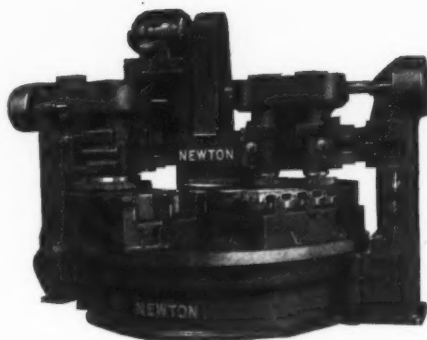
Dependable—Accurate—Cost Cutting
Equipment, built to suit the require-
ments of a wide variety of work.



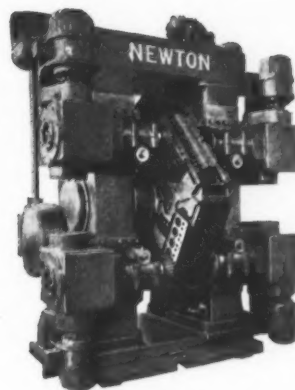
MACHINES
SHOWN ON
THIS PAGE
ARE FOR
MILLING



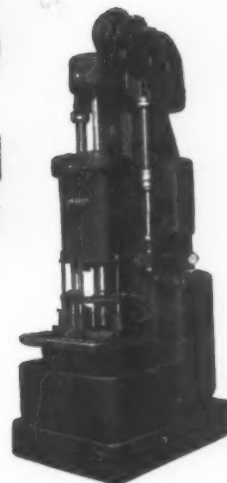
BORING &
DRILLING



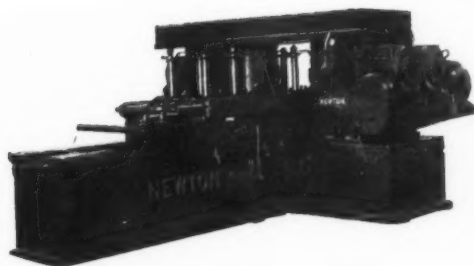
OTHER
MACHINES



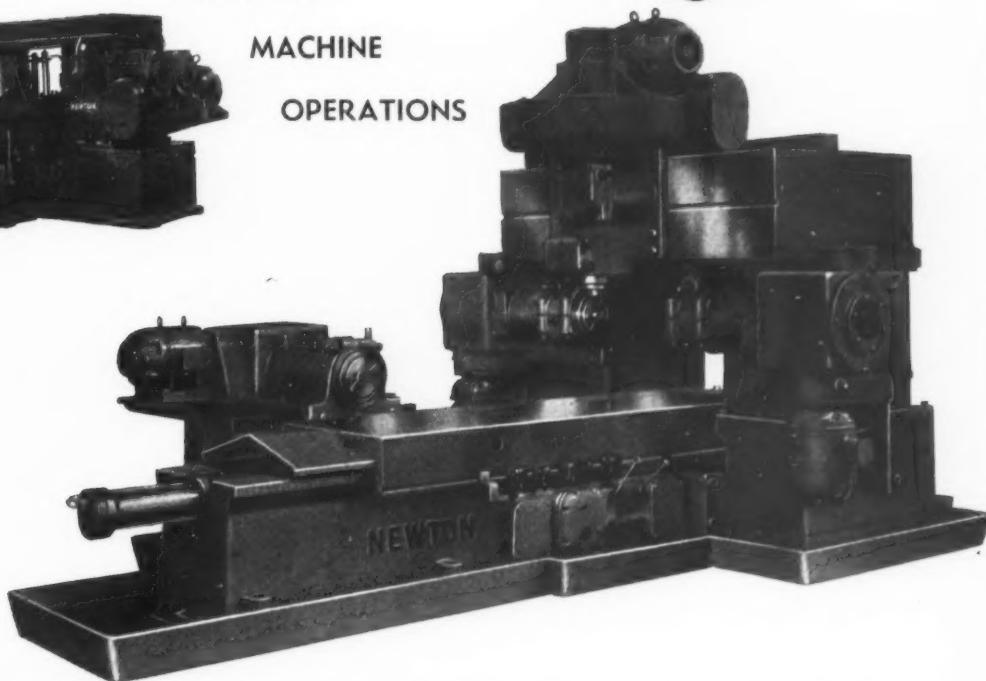
BUILT FOR
OTHER



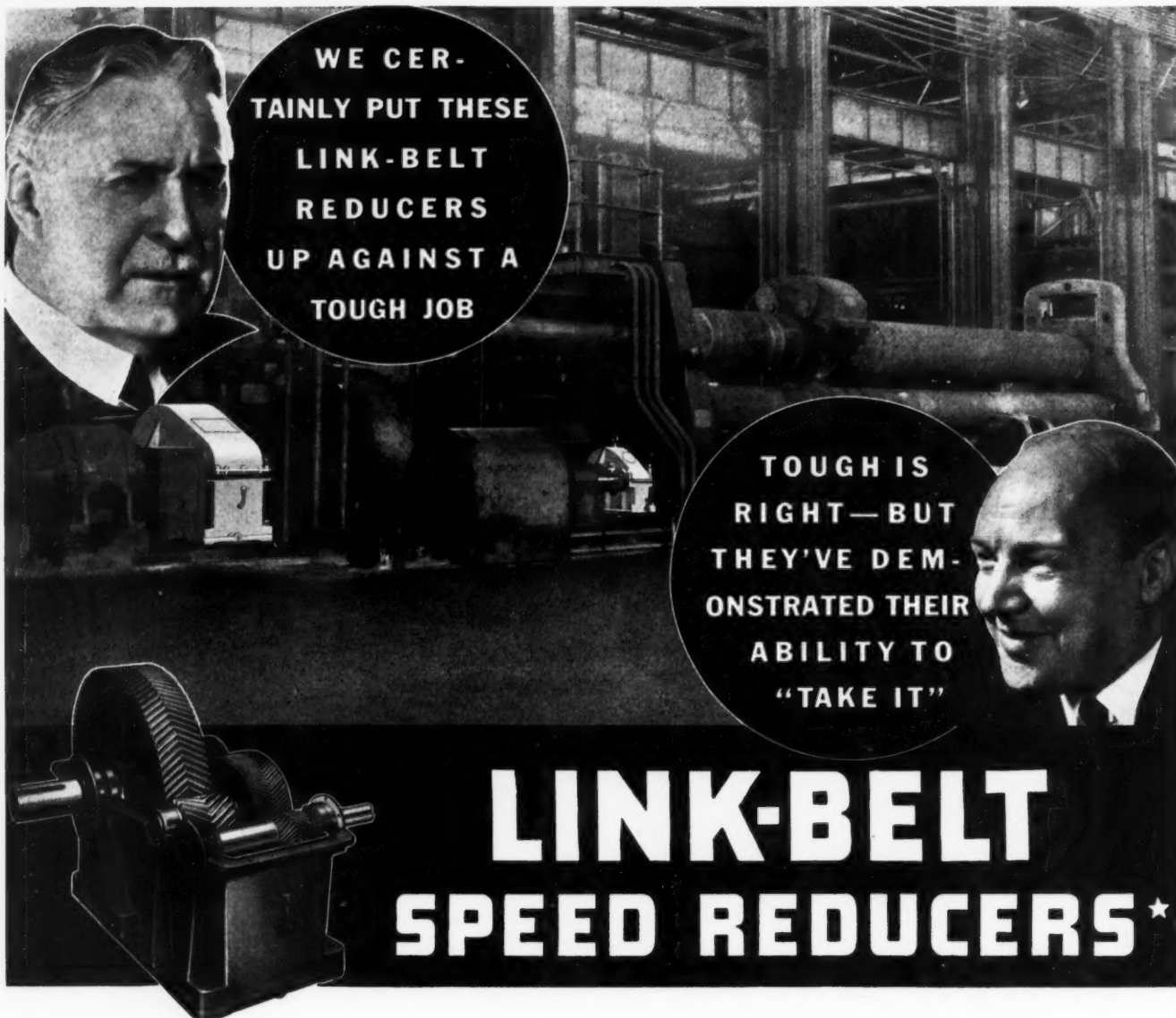
STANDARD



MACHINE
OPERATIONS



CONSOLIDATED
MACHINE TOOL CORPORATION
ROCHESTER NEW YORK



WE CERTAINLY PUT THESE
LINK-BELT
REDUCERS
UP AGAINST A
TOUGH JOB

TOUGH IS
RIGHT—BUT
THEY'VE DEM-
ONSTRATED THEIR
ABILITY TO
"TAKE IT"

LINK-BELT SPEED REDUCERS★

★ One of the seven types of Link-Belt positive drives—the other six are illustrated below. Superintendents, plant engineers and others should have our book on the complete line of positive drives. They'll appreciate its value. Send for Binder No. 2100.



V.R.D. VARIABLE
ROLLER DRIVE



MOTORIZED
REDUCER



SILENT
CHAIN DRIVE



P.L.V. GEAR
SPEED VARIATOR



WORM GEAR
REDUCER



ROLLER
CHAIN DRIVE

● Heavy duty machinery requires power transmission drives that will keep the wheels turning day-in and day-out to insure profitable returns. It's on just such installations that Link-Belt positive drives prove their outstanding superiority. Delivering power in a smooth, uniform flow to bend plates as thick as 3½ inches, calls for the utmost in dependability and efficiency, but it's just another job for Link-Belt Herringbone Gear Reducers—because they have everything that it takes.

Whatever the power transmission problem, Link-Belt can best supply the ideal solution, because only Link-Belt makes every type of positive drive. Consultation with a Link-Belt positive drive specialist involves no expense and entails no obligation.

Address Link-Belt Company, Philadelphia, Chicago, Atlanta, Indianapolis, San Francisco, Toronto, or any offices located in principal cities.

5740-A

POSITIVE DRIVES *bring* POSITIVE PROFITS

The *New* SEVEN JEWEL

FEDERAL
INDICATOR



LOW-FRICTION

for greater
PRECISION

Just as the finest, most dependable watches have many jewels so do the New FEDERAL LOW-FRICTION indicators have full jewel bearings.

This new development in FEDERAL Indicators, together with other new details of construction, has resulted in an instrument which has greater accuracy than ever before. While it is more sensitive in giving you the real facts about measurements, it is nevertheless more rugged than ever. Users already have found this LOW-FRICTION Indicator has saved them money on their problems of production and assembly.

For further information write

FEDERAL PRODUCTS CORP.

1144 EDDY STREET

PROVIDENCE, R. I.

DETROIT • CHICAGO • MUNCIE • CLEVELAND • NEW YORK

MACHINERY, August, 1936—47



The advertisement features a large, detailed illustration of a Commercial Annular Ball Bearing in the center. The bearing has a circular outer ring with the word "Commercial" arched across the top and "ANNULAR" arched across the bottom. Inside the ring, a series of small, dark balls are arranged in a circular pattern. Above this central bearing, four smaller, circular inset images show different views or types of bearings, each with text overlaid: "STANDARD SIZES", "SPEEDS UP TO 2500 R.P.M.", "SELF CONTAINED", and "DUAL THRUST". The background is dark with two light-colored diagonal bands crossing behind the central bearing.

STANDARD SIZES

SPEEDS UP TO 2500 R.P.M.

SELF CONTAINED

DUAL THRUST

“Commercial”
ANNULAR

**EFFICIENT PERFORMANCE PLUS
MODERATE COST**

“COMMERCIAL” ANNULAR BALL BEARINGS combine efficiency with economy. Available in more than 1000 stock sizes. Can be built to your specifications or designed and built to meet your conditions. Our engineers will be pleased to solve your ball bearing problem.

INEXPENSIVE, ACCURATE, STURDY, RELIABLE AND LONG-LIVED.

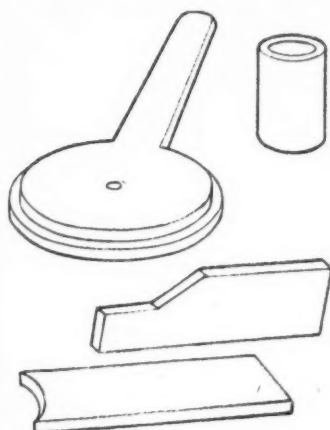
THE SCHATZ MANUFACTURING CO.
POUGHKEEPSIE, N. Y.
Detroit Sales Office: 2608 Book Tower.
Chicago Sales Office: 120 N. Peoria St.

“Commercial”
ANNULAR BALL BEARINGS

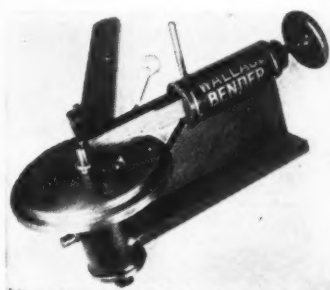


Your machine may seem complicated, but it is simply an assembly of PARTS. One or more of these parts can be made BETTER at LOWER COST by "Shield-Arc" welding.

You can start now. Change one part at a time to "Shield-Arc" welded construction and thus reduce your costs and improve your product. Simply take standard mill shapes and cut them to proper size, like this—



Then assemble and fuse these shapes into a single unit by "Shield-Arc" welding, like this—



The Lincoln man nearby can show you how. He is at your service without obligation. Photos courtesy of Wallace Supplies Mfg. Company.

It weighs 50 lbs. too much

This small bending machine could make a much quicker trip to market if it were made easier to use at the workman's bench. For one thing, its weight could be cut 50 lbs. by changeover to steel construction, "Shield-Arc" welded.

Until this part is changed to the lighter, more serviceable "Shield-Arc" welded construction, it is a Guilty Part on the shipping floor.

The odds are five-to-one that there is also a Guilty Part in the metal product which you manufacture. Earn its acquittal! Make it stronger. Make it lighter. Make it at less cost. "Shield-Arc" weld it!

The Lincoln man nearby can help you locate those Guilty Parts; he can suggest profitable short-cuts in manufacturing machine parts by welding. Get in touch with THE LINCOLN ELECTRIC COMPANY, Department B-275, Cleveland, Ohio. Largest Manufacturers of Arc Welding Equipment in the World.

P. S.—The above bending machine has been changed to "Shield-Arc" welded construction. It now weighs 29 lbs.; it can be mounted in a vice and requires less set-up time; it is smoother in operation; it will do jobs that will break the old machine; and its cost of manufacture is slightly less!

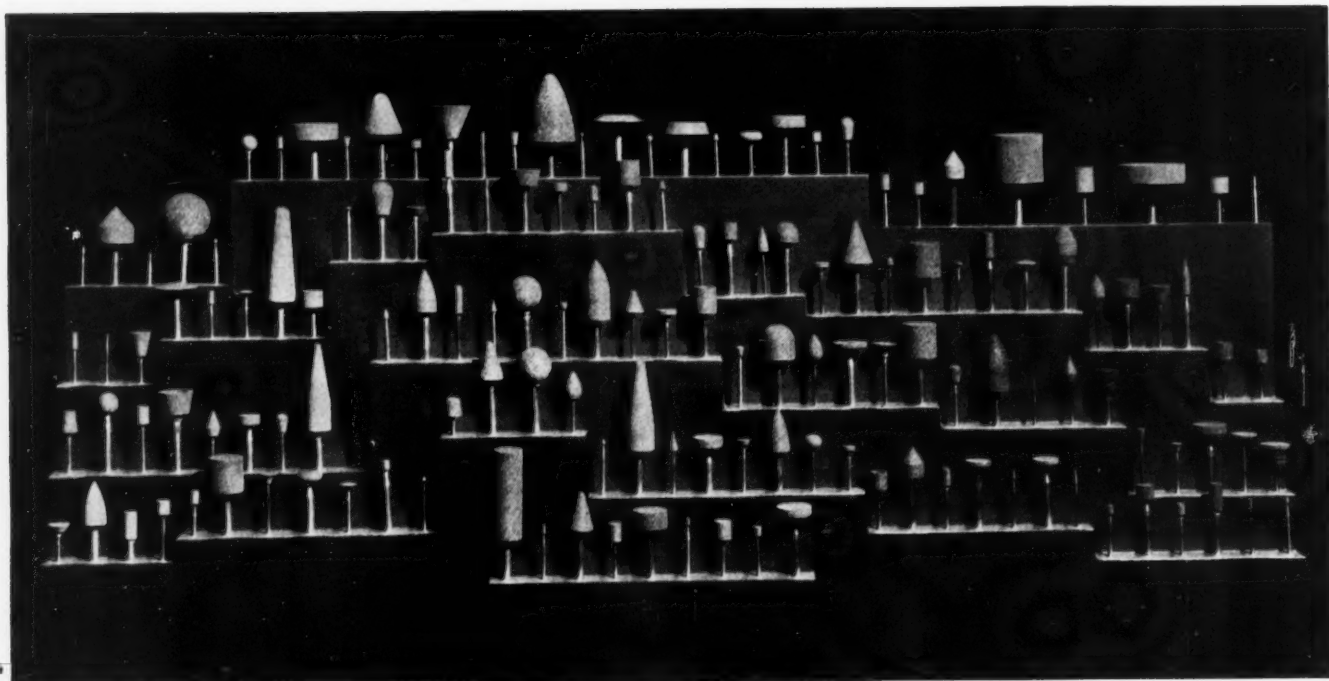
LINCOLN

"SHIELD-ARC" WELDING

THE LINCOLN ELECTRIC CO.
Dept. B-275, Cleveland, Ohio

Send me a free copy of the new booklet, "Lower-Cost Manufacturing by Shielded Arc Welding."

Firm
Name
Position
Address
City State



For Die Grinding and General Tool Room Work . . . NORTON MOUNTED WHEELS AND POINTS

HERE are five of the reasons why Norton Mounted Points and Mounted Wheels are the favorite choice in tool rooms and die shops everywhere:

An almost unlimited variety of sizes and shapes

Fast cutting 38 Alundum abrasive for steels and steel alloys

Crystolon abrasive for cast iron and non-ferrous metals

Nickel plated, tempered steel spindles

Norton Points don't come off the spindle

A catalogue showing the complete line of Norton Mounted Points and Wheels will be sent on request.

NORTON COMPANY, WORCESTER, MASS.

New York	Chicago	Detroit	Philadelphia	Pittsburgh
Hartford	Cleveland	Hamilton, Ont.	London	Paris
	Wesseling, Germany		Corsico, Italy	



W-559

NORTON ABRASIVES

Here's What Users Say About the New Norton "B-E" Bond Wheel

"Satisfactory in every way—better than any other wheels used. Will order in future."

"This wheel is working very satisfactorily, holds a better corner than other wheels tried and still cuts well."

"Very satisfactory, best wheel ever used for surface grinding, cuts freely and coolly. Were able to feed .003" and still hold size across the die. This is more than double the feed with any other wheel."

"Very good in every respect—best wheel ever used for the job and preferred over others for its free cutting ability."

"Satisfactory—tried by several operators on surface grinding machine and all reported it to be the best wheel."

"Very good—prefer to all other wheels—produced better finish with no waves and saves considerable time."

"Satisfactory — about 15% longer life than standard wheels."

*Just a few typical comments —
picked at random from trial reports.*

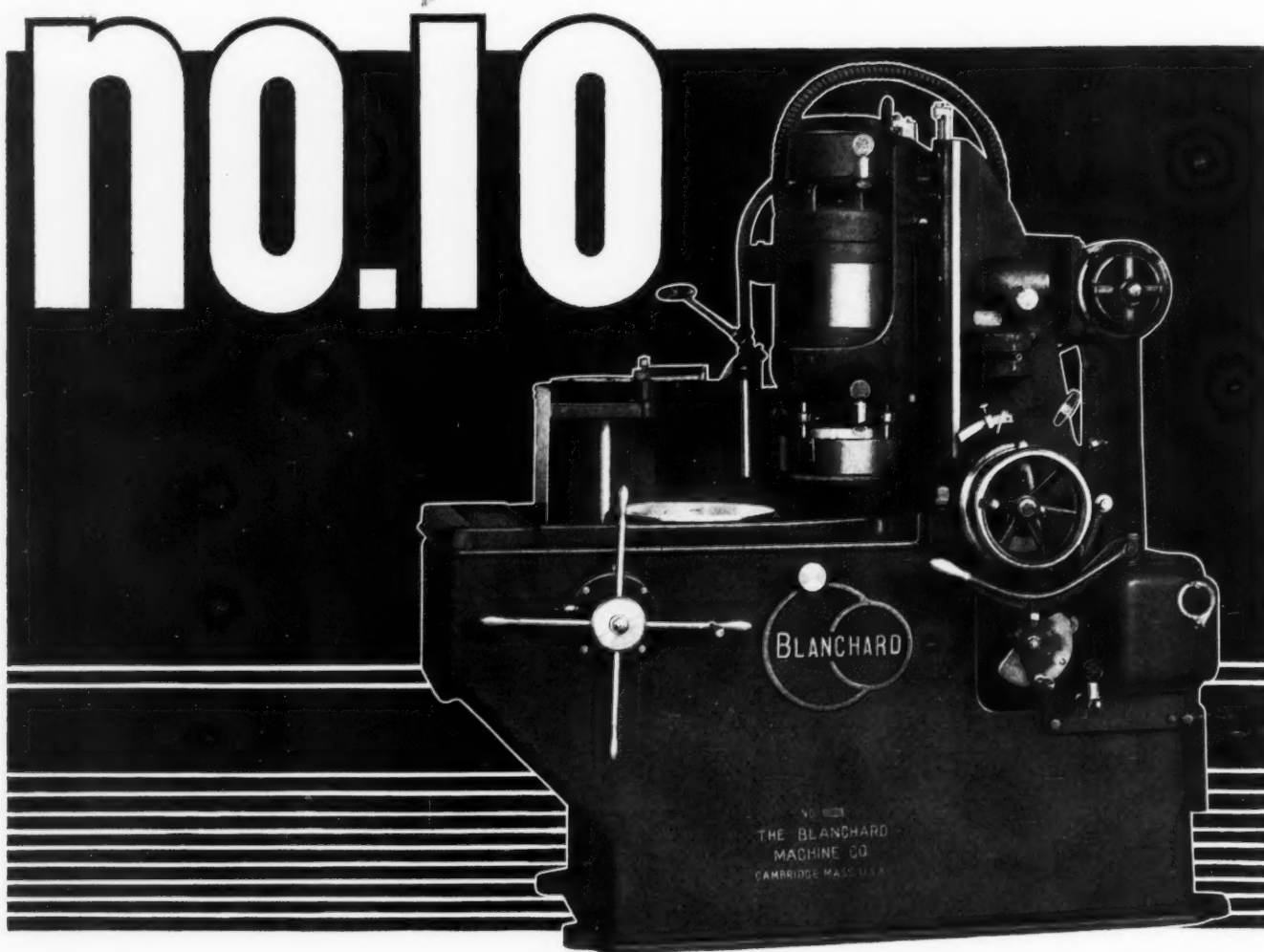
NORTON COMPANY, WORCESTER, MASS.

New York Chicago Detroit Philadelphia Pittsburgh
Hartford Cleveland Hamilton, Ont. London Paris
Wesseling, Germany Corsico, Italy

W-560



NORTON ABRASIVES



THIS machine, with magnetic chuck 16" diameter, is especially suitable for tool-rooms and where the production does not warrant a larger machine.

Blanchard Grinding speeds up the work because it removes metal rapidly—yet finishes accurately, thus often saving an operation.

We will welcome the opportunity to give you conservative time estimates from your blueprints or, if desired, we will grind samples to your specifications and return them to you with our report.

BLANCHARD

THE BLANCHARD MACHINE COMPANY

64 STATE STREET • CAMBRIDGE • MASS.

COLLET AND FEED FINGER SECTION

HARDINGE COLLETS FOR: American, Ames, Boye & Emmes, Carroll & Jamieson, Chard, Cincinnati, Cisco, Dalton, Flather, Greaves - Klusman, Hamilton, Hendey, LeBlond, Monarch, Porter Cable, Pratt & Whitney, Rahn - Larmon, Reed - Prentice, Rivett, Rockford, Sebastian, Seneca, Sidney, South Bend, Springfield, Stark, Sundstrand, Van Norman and our own Hardinge Cataract Lathes.

HARDINGE COLLETS FOR: Ames, Becker, Burke, Pratt & Whitney, Reed - Prentice, Rockford, Stark, Sundstrand, Van Norman and our own Hardinge Cataract Millers.

Bulletin No. 36M gives complete information; dimensions of standard collets; lists attractive prices; makes ordering easy. Gives location of collet stocks in six important centers in the United States.

— SPECIFY HARDINGE COLLETS —

HARDINGE
COLLETS SINCE 1890

DRAW-IN COLLETS
FOR ALL
LATHES AND MILLERS



FOR
— ACCURACY —
— DURABILITY —
— ATTRACTIVE PRICES —
"SPECIFY HARDINGE COLLETS"

Prompt Delivery From Stock

Refer To Inside Pages For Your Requirements
Purchasing and Engineering Departments. Keep This List for Reference Purposes

Hardinge Collets are in stock for immediate delivery. Hardinge Collets embody those elements of precision which have characterized our products since 1890.

HARDINGE BROTHERS, INC., ELMIRA, NEW YORK

Ask for this bulletin No. 36M
if you have
LATHES and MILLERS


HARDINGE BROTHERS, INC. ELMIRA, N. Y.

MORRISON

COLLETS

AND

FEED FINGERS



MORRISON MACHINE PRODUCTS, INC.
ELMIRA, NEW YORK

Ask for this catalog No. 34M
if you have
AUTOMATIC and HAND SCREW MACHINES

MORRISON COLLETS, FEED FINGERS, MASTER COLLETS, MASTER FEED FINGERS, AND PADS FOR: Brown & Sharpe, Cleveland, Cone, Gridley, National Acme, New Britain, Davenport, etc., Automatics.

MORRISON COLLETS FOR: Bardons & Oliver, Cincinnati, Foster, Garvin, Pratt & Whitney, Warner & Swasey, etc., Hand Screw Machines.

Catalog No. 34M gives complete ordering information and lists attractive prices. Illustrates and describes Style "B" Morrison Master Feed Fingers and Pads which eliminate scoring of stock.

— STANDARD SIZES IN STOCK FOR
IMMEDIATE DELIVERY —

MORRISON MACHINE PRODUCTS, INC. ELMIRA, N. Y.

FORMERLY:

3 Machines

3 Set-ups

to machine this part

NOW:

**All done on 1 Automatic
Screw Machine
in one set-up**



You can get similar production economies with these cutting oils—

BEFORE these new type cutting oils came on the market, this part had to be turned on an automatic—drilled in a drill press—and tapped on an automatic tapping machine.

On the first try with Sultex Cutting Oil A, this Norway Iron part was completely finished on a No. 00 Brown & Sharpe Automatic. At that time:—

Surface speed was 130 ft. per min.; Production, 51 pieces per hr.; All tools were working satisfactorily after 16 hours.

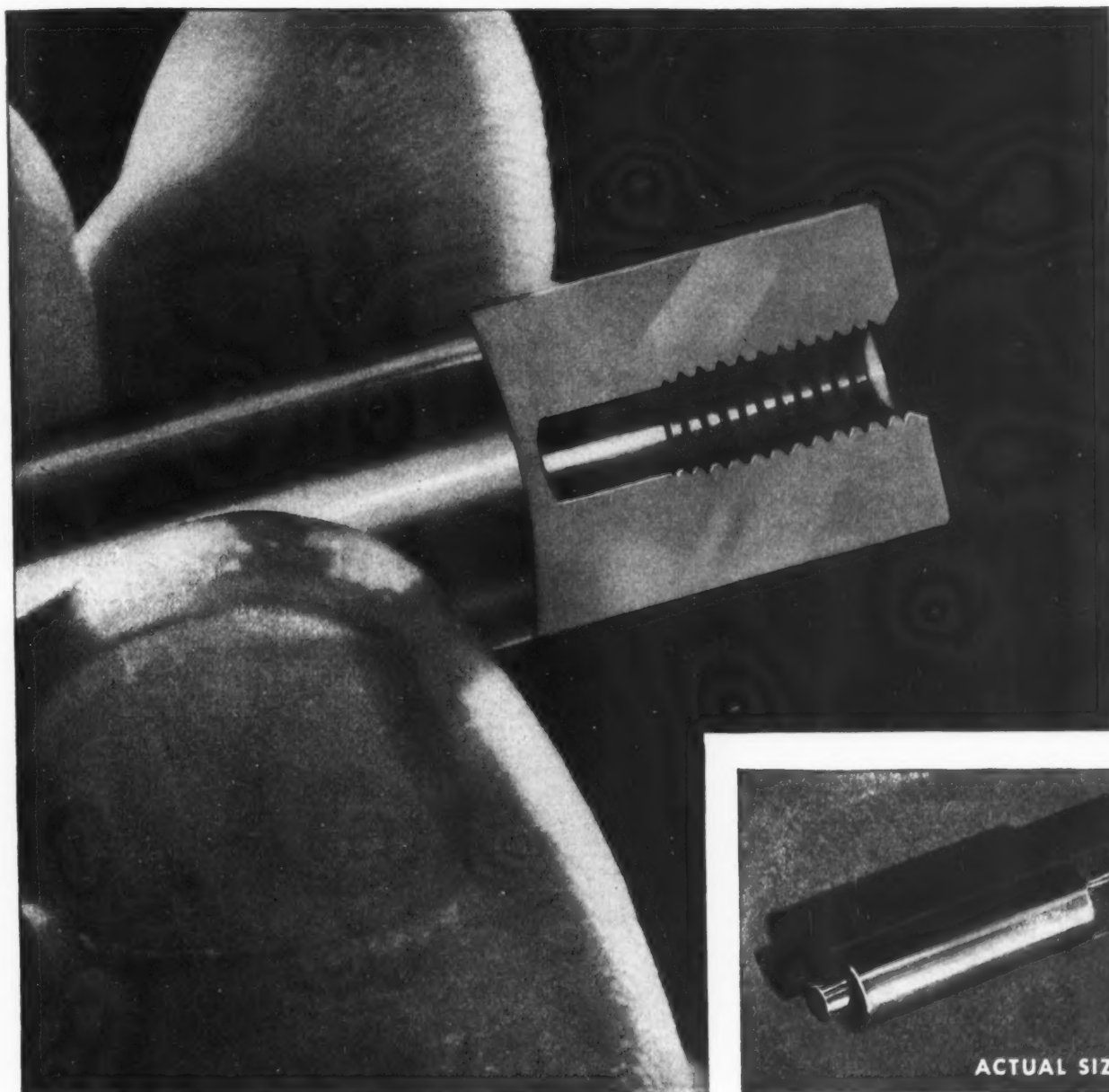
Later:—the speed increased to 197 feet per minute—75 pieces per hour—no tools were ground in eight hours.

Still later:—speed increased to 235 feet per minute—90 pieces per hour—time between tool grindings, 7½ hours.

This is just one of the many savings that Texaco Sultex and Soluble Oils have made in this plant.

Other plants report the same type of economies. In fact . . .

The New **TEXACO**



In every plant where these oils have been given a fair test they have showed improved performance against the oils then in service.

You have the right to expect and get similar performance from these products.

A Texaco representative will be glad to arrange for such a test and to provide practical engineering service to prove the economies of the New Texaco Cutting and Soluble Oils.

THE TEXAS COMPANY, 135 East 42nd St., N. Y. C.
Nation-wide distribution facilities assure prompt delivery

Here is new efficiency for cutters and grinders in this group of oils

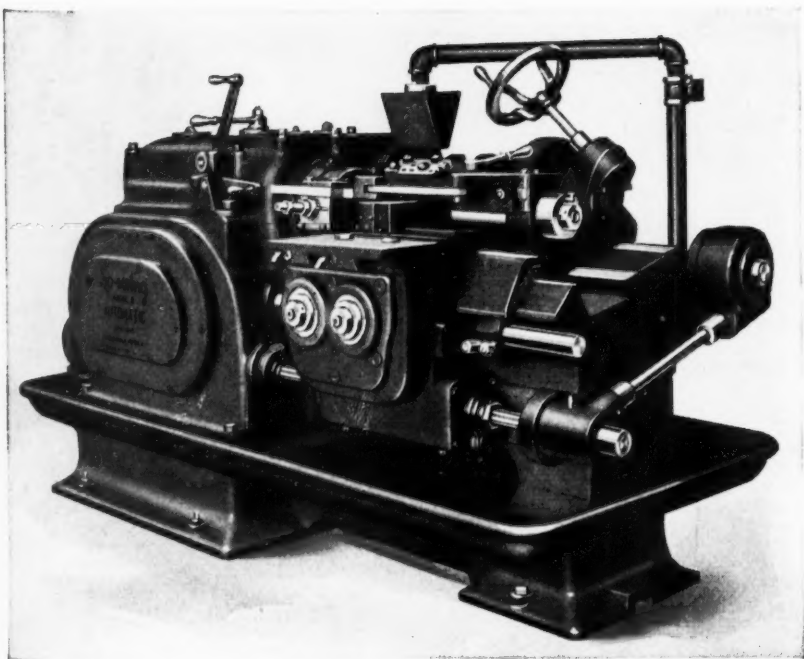
New—Texaco Sultex Cutting Oil—A
New—Texaco Sultex Cutting Oil—B
Texaco Cutting Oils
Texaco Soluble Oil—C



Cutting and Soluble Oils

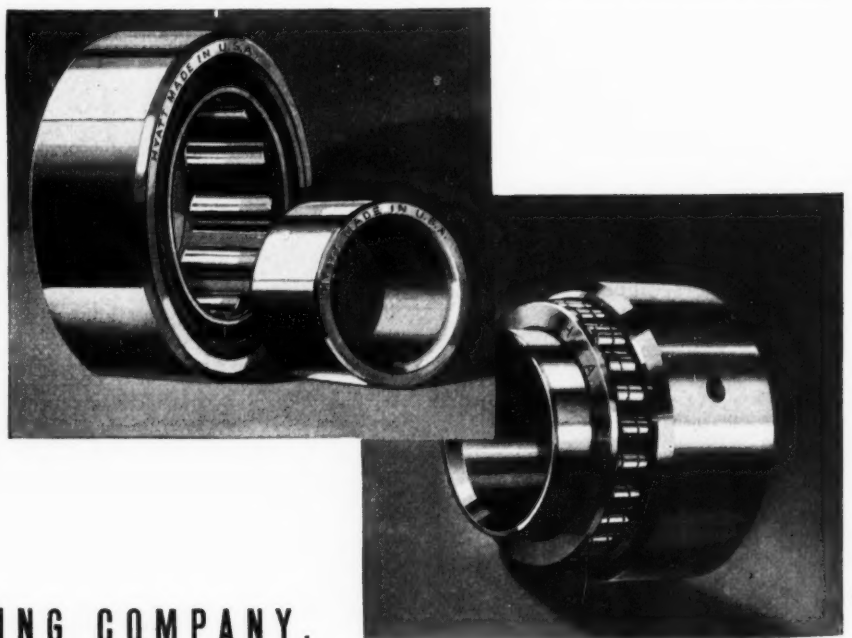
MACHINERY, August, 1936—55

When it's a **PRECISION** *job..*
— it's a job for —
HYATT ACCURACY



By virtue of the scope of its resources, the skill of its technicians, the profit of its experience, Hyatt produces the finest roller bearings. Bearings that endure the merciless punishment of speed, stress, and shock without perceptible wear. Bearings that defy the imagination in their matchless perfection. Quiet bearings that keep related parts in permanent alignment. Bearings that serve longer and more efficiently, with the minimum of maintenance.

LO-SWING LATHES, a product of the Seneca Falls Machine Co. of Seneca Falls, N. Y., need no introduction when it comes to accuracy of work and dependability of operation. Hyatt Roller Bearings are an important part of their quality construction and a generous contributor to their fine performance. Another machine tool builder who for years has recognized how well Hyatts save and serve.



HYATT ROLLER BEARING COMPANY,
NEWARK, DETROIT, CHICAGO, PITTSBURGH, SAN FRANCISCO. IN EUROPE, 111 GROSVENOR ROAD, LONDON, S. W. 1.



**250,000 XLO
DRILL JIG BUSHINGS**
in stock for
IMMEDIATE DELIVERY

Furnished in 6 types and standard sizes from $\frac{3}{16}$ " to $1\frac{3}{4}$ " hole size to fill every drilling requirement, stocked in New York and Detroit. XLO Bushings have been recognized for uniform accuracy and hardness since 1925. Send for data sheet and price list.

EX-CELL-O

AIRCRAFT
& TOOL

CORPORATION

DETROIT,
MICHIGAN



COUPON

Please send me descriptive literature on XLO products as indicated below:

① ② ③ ④ ⑤ ⑥ ⑦ ⑧

Name _____

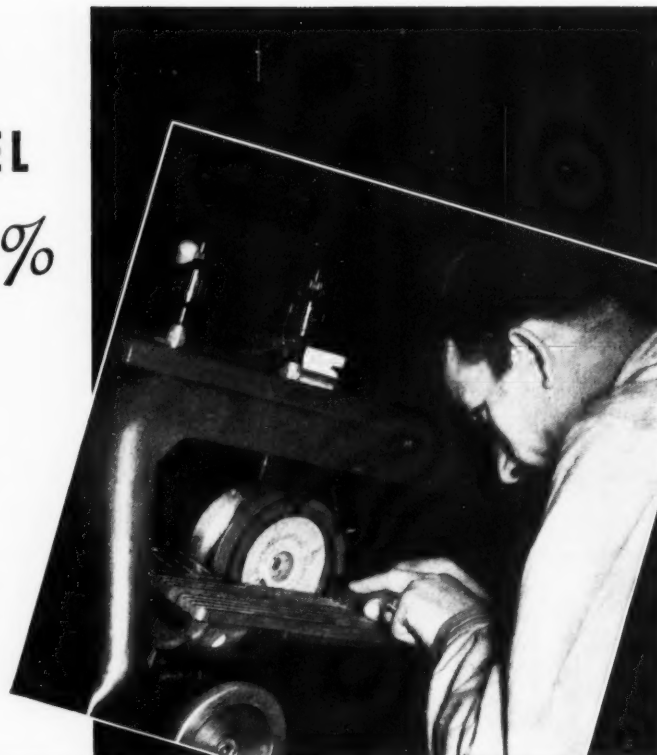
Position _____

Company _____

City and State _____

THE CARBORUNDUM REG. U. S. PAT. OFF. BRAND DIAMOND WHEEL SAVES 15% TO 50% in grinding time:

FIFTEEN to fifty per cent time saved in the grinding and conditioning of cemented tungsten carbide tools. As high as eight times the number of pieces turned per grind. That's the story of the Carborundum Brand Diamond Wheel as contrasted with a vitrified wheel and lap. The tests tabulated here were all scientifically conducted and carefully checked.



NAME	WORK	% TIME SAVED BY DIAMOND WHEEL	NUMBER PIECES PER GRIND	
			Vit. Wheel and Lap	Diamond Wheel
Diamond Boring Tool	Cylinders	20%	40	300
Diamond Facing Tool	Compressor Block	20%	90	600
Reamer Blade	Compressor Cover	50%	2700	4200
Pulley Grooving Tool	Compressor Pulley	30%	200	400
Oil Grooving Tool	Piston	50%	700	1400
Finish Grooving Tool	Piston	15%	325	550
Facing Tool	Cover	25%	350	400
Finish Turning Tool	Thrust Plate	40%	450	500
Rough Turning Tool	Block	30%	60	125

Figures and data courtesy of Kelvinator Corporation. Work refers to Kelvinator Refrigerator parts

The Carborundum Brand Diamond Wheel—as its name implies—is made with genuine South African Diamonds crushed and scientifically bonded. It not only effects such savings as indicated above, but it produces perfect edges, straight, clean, unnicked and beautifully finished.

For rough grinding and conditioning, for backing off the tools there is the same high efficiency in Carborundum Brand "Green Grit" Silicon Carbide Wheels.

You need both types of wheels—the "Green Grit" and the Diamond Wheel for complete effective service.

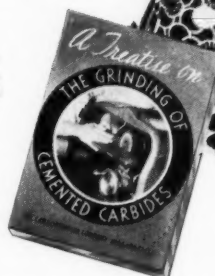
THE CARBORUNDUM COMPANY

REG. U. S. PAT. OFF.

Niagara Falls, N. Y.

Sales Offices and Warehouses in New York, Chicago, Boston, Philadelphia, Cleveland, Detroit, Cincinnati, Pittsburgh, Grand Rapids. (Carborundum and Alloxite are registered trade-marks of The Carborundum Company.)

SEND FOR BOOKLET... "A Treatise on the Grinding of Cemented Carbides" is an authoritative work that will prove helpful to anyone concerned with the use of cemented carbides.



HAYNES STELLITE

J-METAL *Cutting Tools*



THIS shows a half-inch square Haynes Stellite J-Metal tool rough-boring an outer race for a self-aligning ball bearing, made of SAE 52100 steel. Cutting speed is 144 feet per minute, with a water and oil lubricant. The feed is .009 inches per revolution, with a depth of cut of .020 to .095 inches. The floor-to-floor time per piece is one minute. This represents an increase in

production speed of 25 per cent. In addition the Haynes Stellite J-Metal tools last *35 per cent longer between grinds.*

Specific data on applications in which you are interested will be furnished on request, or one of our engineers will be glad to assist you in your machining problems. This service is available without obligation.



*A red-hard, wear-resisting alloy of
Cobalt, Chromium and Tungsten*

HAYNES STELLITE COMPANY

Unit of Union Carbide and Carbon Corporation



Chicago • Cleveland • Detroit • Houston • Los Angeles • New York • San Francisco • Tulsa

General Office and Works—Kokomo, Indiana

Foreign Sales Department—New York City

Haynes Stellite Welding Rods and information on other Haynes Stellite Products also are available through the 42 apparatus shipping points of The Linde Air Products Company



**THERE IS A
DIFFERENCE**

It shows up

IN

CUTTING SPEED

● Not only cutting speed, but *safe* cutting speed plays a large part in your small tool satisfaction. The ability of Morse Tools to maintain high cutting speeds safely and economically is one of the reasons why production and shop men everywhere say "there is a difference."

What assures this difference in Morse Tools? Years of experience in the making of precision cutting tools put one extra value behind the Morse trade mark. Another results from carefully controlled hardening, another from exceptional accuracy in grinding. Step-by-step inspection adds its part.

Next time you hear someone say that all leading metal-removing tools are alike, tell him to try Morse Tools. Tell him it will be worth his while in lower costs and better work to prove to himself "there is a difference."

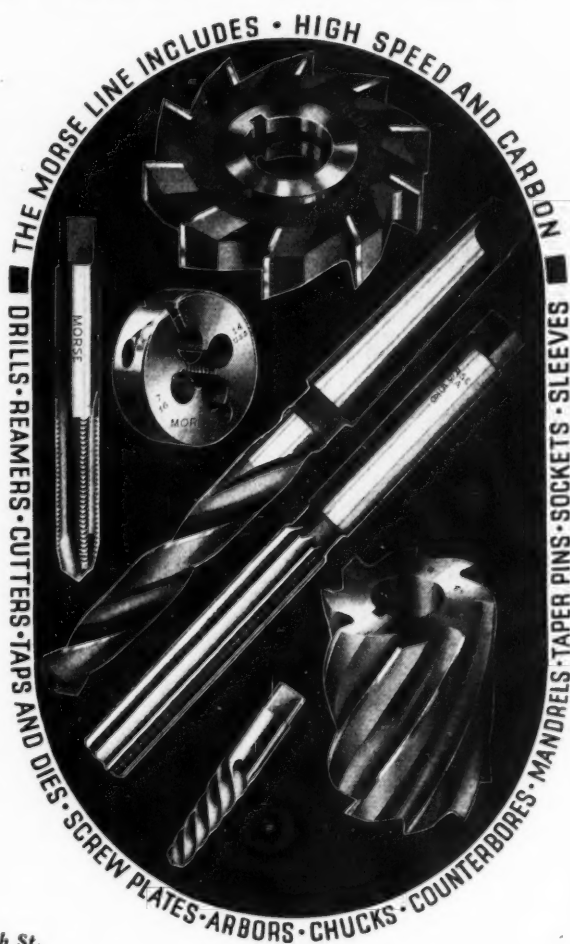
A conveniently located Morse Distributor assures prompt service.

MORSE

**TWIST DRILL & MACHINE COMPANY
NEW BEDFORD . . . MASS., U. S. A.**

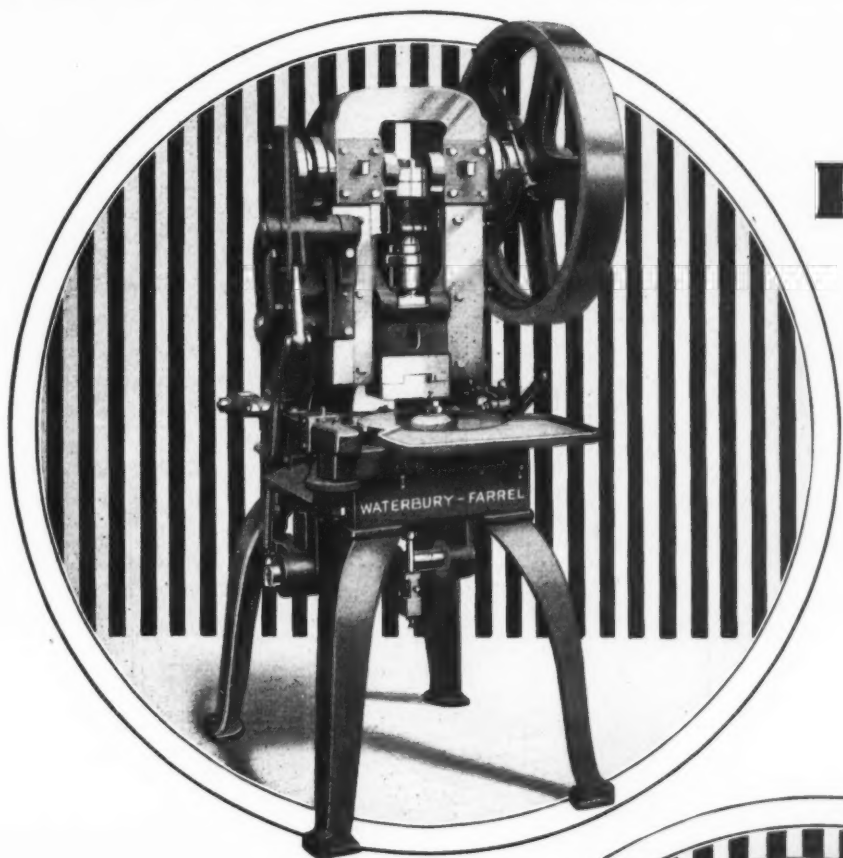
New York Store: 130 Lafayette St. • Chicago Store: 570 West Randolph St.

60—MACHINERY, August, 1936



WATERBURY-FARREL

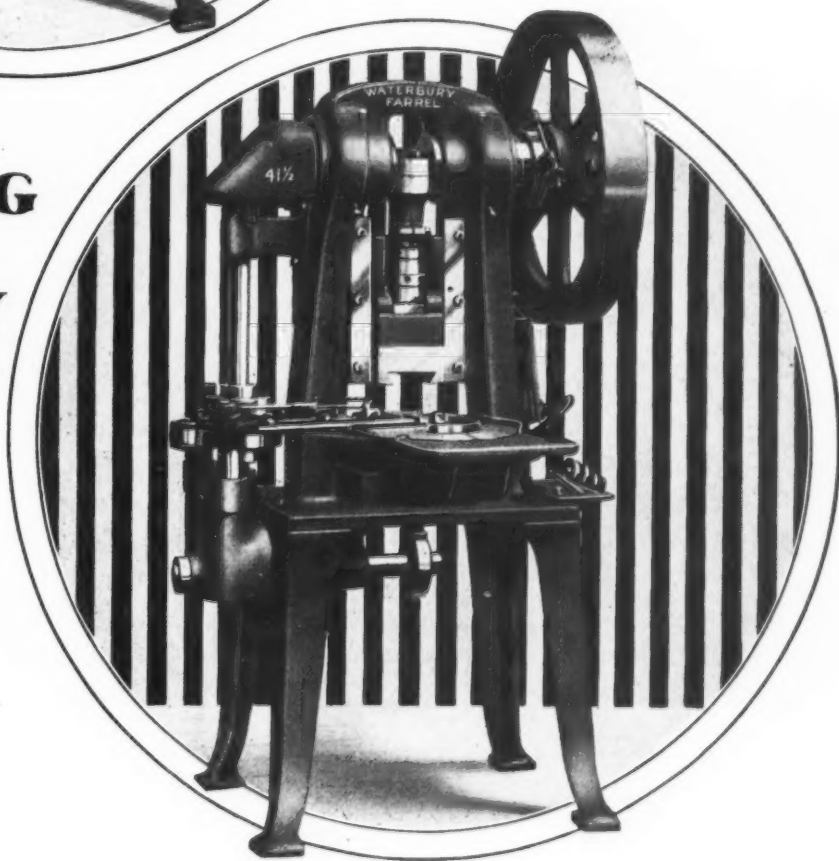
DIAL PRESSES



*At Left—No. 4 Open-back
press with ratchet dial,
safety indexing device and
die knock-out.*

*Below—No. 41 1/2 Pillar
press with friction dial,
knock-off finger and die
knock-out.*

**FOR
REDRAWING
AND OTHER
SECONDARY
OPERATIONS**



**WATERBURY FARREL FOUNDRY AND MACHINE COMPANY
WATERBURY, CONNECTICUT**

NEW YORK

CHICAGO

CLEVELAND

MACHINERY, August, 1936—61



40 LUMENS *per watt*

**ASSURE MORE PRODUCTIVE LIGHT
AT LOWER COST**

The General Electric Mercury Lamp provides industry with more light at lower cost than can be obtained in any other way. Its rated output of 40 lumens per watt is a 100 per cent increase in industrial lighting efficiency. You get twice the light for the same current.

Many inherent advantages of mercury vapor light are now made available in this

lamp with a standard Mogul screw base for vertical mounting. The lamp has an average life of 2,000 hours and is self-starting on either 110- or 220-volt, 60 cycle circuits, with specifically-designed General Electric ballast units . . . Write for descriptive folder and detailed information to either of the two General Electric divisions listed below.

GENERAL  ELECTRIC

General Electric Vapor Lamp Co.
893 Adams Street, Hoboken, N. J.

Incandescent Lamp Department
Nela Park, Cleveland, Ohio

Order your auxiliary devices which were designed especially for this lamp from the General Electric Vapor Lamp Co.

SLASHING COSTS 50% ON SMALL LOT JOBS!

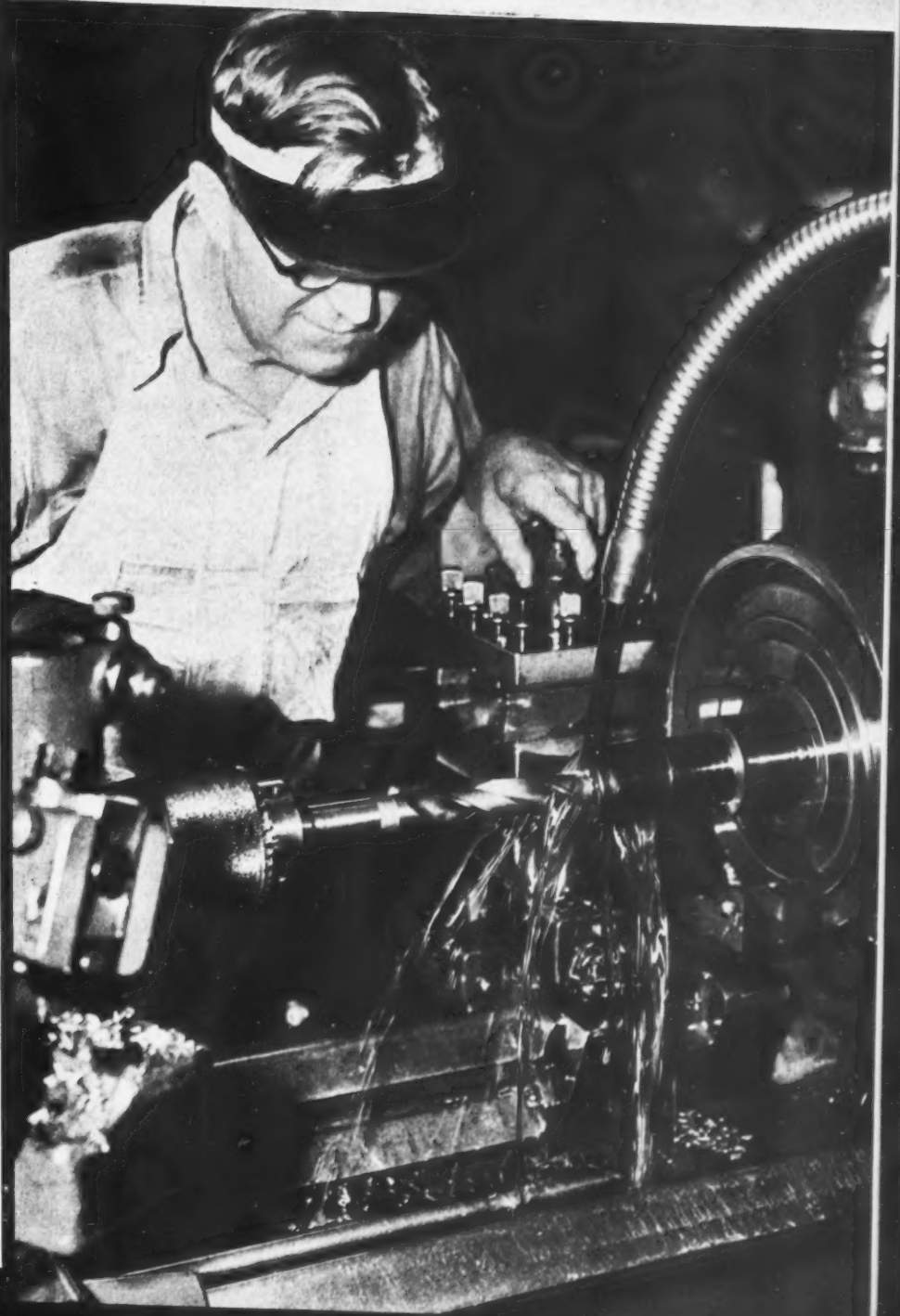
ONE of our customers . . . Chambon Corporation, manufacturers of printing machinery . . . doing general bar and chucking work in lots from three to twelve pieces . . . *had to cut costs on their turning work.*

Warner & Swasey was called in . . . our man rolled up his sleeves and went to work in their plant. Based on his findings he recommended the replacement of their old lathes with new high speed Warner & Swasey turret lathes. The result . . . *costs were cut 50% on these small lot jobs . . . and the machines paid for themselves in two years on regular production.*

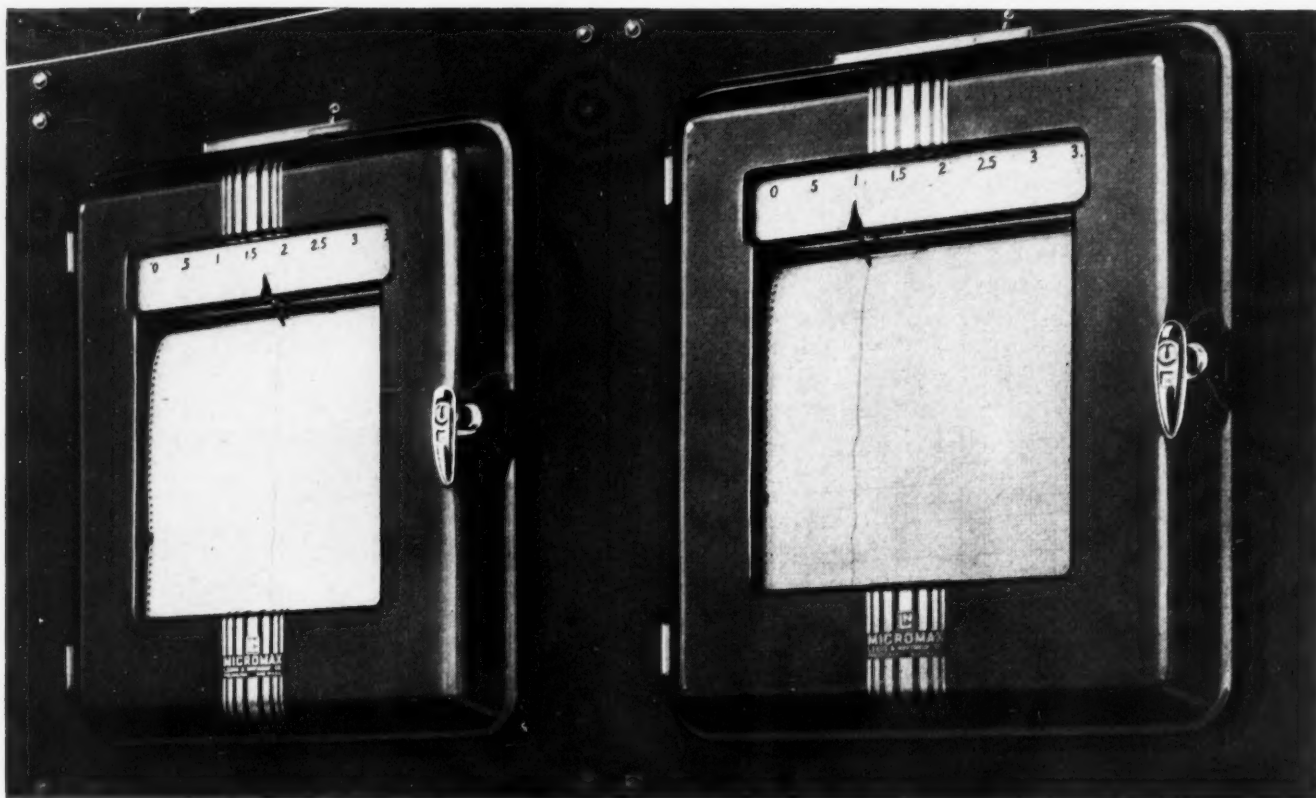
This satisfied the management and the operators too. Being able to combine operations on the new machines the work is now done much quicker, more accurately and with much less effort.

You may say your problem is different — good!

No two turning problems are alike. Our experience, living with these problems year after year, enables us to quickly arrive at a plan, profitable to our customers. Our analysis of your work may result in similar savings for you. If you are interested, *now* is the time to find out—we'll cooperate.



WARNER & SWASEY *Turret Lathes* CLEVELAND



Two Silver-Anniversary Micromax Potentiometer Pyrometers; note visibility of index, and length of chart.

Packed

WITH THE VALUES OF A QUARTER-CENTURY

The Silver-Anniversary Micromax records and indicates with utmost boldness—puts facts where the user can see them easily. It not only provides all the usual combinations of indicating, recording, signalling and controlling, but also provides combinations which cannot be had in a recorder of any other model. It meets industry's needs as they have never been met before.

The industrial reputation of the potentiometer grew out of just one group of instruments—the products of Leeds & Northrup. Every merit of those instruments—every feature that made them Industry's standard for reliable records—is inherited by the Silver-Anniversary Micromax. It inherits reliability, sensitivity and accuracy; it adds visibility, versatility and accessibility. Here is an advanced Recorder; a complete, mature machine which reflects in scores of details the 25 years of pioneering experience that make possible its performance.

Its merits will be most obvious to those who know most about pyrometer values, but its reliable performance and low operating cost will recommend it to all.

L & N PRODUCTS

MEASURING INSTRUMENTS FOR PLANT MEASUREMENT AND CONTROL

Indicators Recorders
Controllers Telemeters
Automatic Control

ELECTRIC HEAT-TREATING FURNACES

Triple-Control Hump Hardening
Homo Tempering
Homo Nitriding
Ho-Hump Multipurpose
Furnaces

MEASURING INSTRUMENTS FOR RESEARCH, TESTING AND TEACHING

Potentiometers Bridges
Test Sets Standards
Galvanometers Dynamometers
Photometric and Synchronous
Equipment

J-N33A (9)



LEEDS & NORTHRUP COMPANY
4921 STENTON AVENUE

PHILADELPHIA, PA.

LEEDS & NORTHRUP

MACHINERY'S

MODERN EQUIPMENT CONTEST

\$500 IN PRIZES

For the Best Examples of Savings Directly Due to the Installation of More Modern Plant Equipment

Has some new machine tool, small tool or accessory in your shop resulted in a large net saving?

Well-equipped plants throughout the mechanical industry contain many new installations often yielding from five to twenty-five times the return from any other investment. MACHINERY'S publishers are conducting this contest to secure the main facts about such outstanding examples of savings through the modernization of shop equipment.

Lengthy articles or reports are not wanted. Merely give briefly and in 1, 2, 3 order whatever facts and figures are necessary to prove the net saving on the investment in new equipment.

Anyone is eligible to enter this contest. The procedure is simple as shown by the instructions on the next page.

Successful plants and shops are not the obsolete ones. Financial executives know this, but nothing is so convincing as concrete evidence. The object of this contest is to round up some of the more striking examples of dollars-and-cents reasons for investing in modern equipment wherever there is definite proof of a saving.

The 20 Prizes Offered:



First Prize	\$100
Three Prizes, each	50
Six Prizes, each	25
Ten Prizes, each	10



These prizes will be awarded by the following board of three judges:

Norman D. MacLeod, President, National Machine Tool Builders' Association.

N. A. Booz, President, Associated Machine Tool Dealers.

Erik Oberg, Editor, MACHINERY.

See Detailed Instructions on Other Side

MACHINERY, 143 Lafayette Street, New York

MACHINERY'S

MODERN EQUIPMENT CONTEST

\$500 IN PRIZES

The Object of This Contest is to Present Definite Proof that Investments in Recently Developed Equipment are Paying Many Manufacturers Unusually Large Dividends

General Instructions

Before submitting any example of saving resulting from equipment modernization, proper authorization from your firm should be secured.

Submit only cost-saving facts of which you have first-hand knowledge. The name of the firm using the equipment selected as an example must be given but will not be published unless authorized. The "makes" of equipment (manufacturers' names) may be given but will not be published. This contest is to promote the use of all modern developments that will "pay their way" and benefit the mechanical industry.

How to Enter This Contest

Locate in your plant any outstanding example of new equipment which has definitely proved to be a very good investment. The contest includes all classes of machine tools, small tools, work-holding or work-handling apparatus, and other accessories. Any number of examples may be submitted. The equipment selected must be on the market and not a special design made for your own use.

Kind of Information Required

Give all facts and figures needed to prove whatever net saving, in actual dollars and

cents, is due to the investment in new equipment. The interest on the investment in both new and old equipment must be taken into account, as well as the depreciation and any items such, for example, as special tooling costs which may be large enough to seriously affect the result. Differences in rates of production with the new and old equipment and savings in labor costs are, of course, essential items in determining the net annual return on the investment, which figure must in all cases be given.

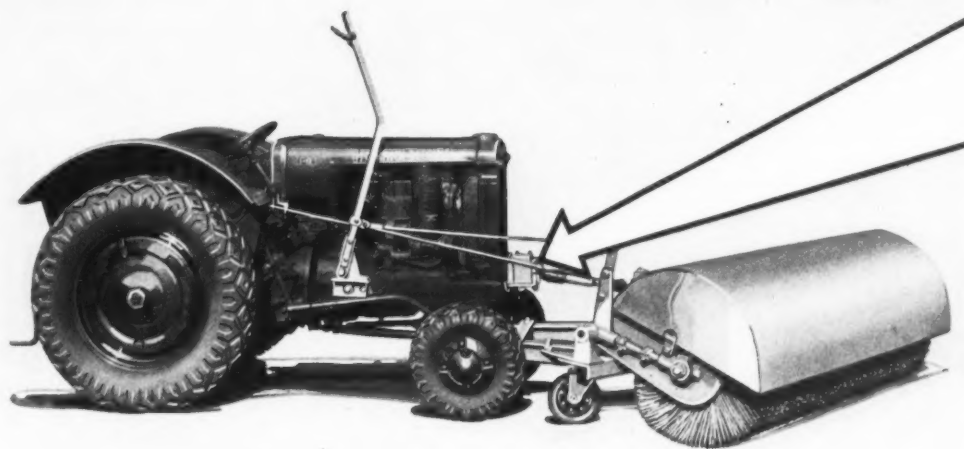
If Additional Information is Desired

If you know of some good example of saving through modernization but are in doubt as to the exact information wanted, write to MACHINERY, 148 Lafayette St., New York, and special instruction applying to your case will be given. The prizes are to be awarded primarily to those locating the best examples, and your method of presenting the essential facts will not be considered so long as sufficiently complete and convincing information is given.

Time Limit on Contest

Material to be eligible for a prize must be mailed before October 1, 1936.

MACHINERY, 148 Lafayette Street, New York



Single-Type Pullmore

Single and Double Types

Pullmore Clutches are made in single and double types, for operation in oil or dry, in capacities ranging from 1 h. p. to 75 h. p. at 500 r. p. m.



Double-Type Pullmore

PULLMORE CLUTCHES used in Detroit Sweepers

Illustrated is a Detroit Sweeper Attachment, manufactured by the Detroit Harvester Company, in which a No. 2 Single, Oil-Type Pullmore Clutch transmits and controls power from the tractor engine to the sweeper. The Pullmore Clutch is built into the power take-off unit; one of many uses to which these clutches are applied with excellent results.

The fine performance records established by Pullmore Clutches are due to: good design, high quality materials, precision machining

of each component part, careful inspection before shipment.

Pullmore Clutches operate smoothly and easily, are readily adaptable to design requirements, easy to adjust, have ample take-up for long periods of service. They are used in machine tools, cranes, industrial trucks, automatic, semi-automatic and other machines in which reliable, durable, and economical clutches are required. Write, today, for complete information on Pullmore Clutches, and details on our free engineering service.

Over-Center Type Disc Clutches

For heavy-duty service with gasoline or Diesel engine power units, we also make the Rockford O-C toggle-type disc clutch in sizes ranging from 6" to 20" diameter, with single or double drive plates. These clutches are ideal for use in tractors, excavators, pumping units, marine equipment—applications which call for long life under severe operating conditions and long periods of continued service.

ROCKFORD DRILLING MACHINE DIVISION of Borg-Warner Corporation

310 Catherine Street, Rockford, Illinois, U. S. A.

Sold by MORSE CHAIN CO., Ithaca, N. Y., with offices in principal cities



Hydram, with Hydraulic Feed

Self-Oiling, All-Geared Machines For Heavy Duty Drilling and Tapping

Self-Oiling, All-Geared Drilling and Tapping Machines having quick-change all-geared speeds and feeds are built in six sizes. The largest, No. 242, is shown at right. We also build hydraulic feed heavy duty drilling machines, called HYDRAMS, in three sizes. The largest, No. H-3½, is shown at left. Hydrams have rapid approach, feed, dwell if required, quick return, and stop, in an automatic cycle. Hydraulic feeding pressure is applied directly over center of tool and mechanical rotation right at the spindle nose thus eliminating torsional vibration and providing smooth, steady, powerful feed.

These machines are available in single spindle types, Gangs, or High-Production Units in a wide variety of combinations. For maximum production of heavy duty drilling and tapping at minimum cost, use Self-Oiling, All-Geared Machines or Hydrams. Investigate!

Write today for Catalog M.



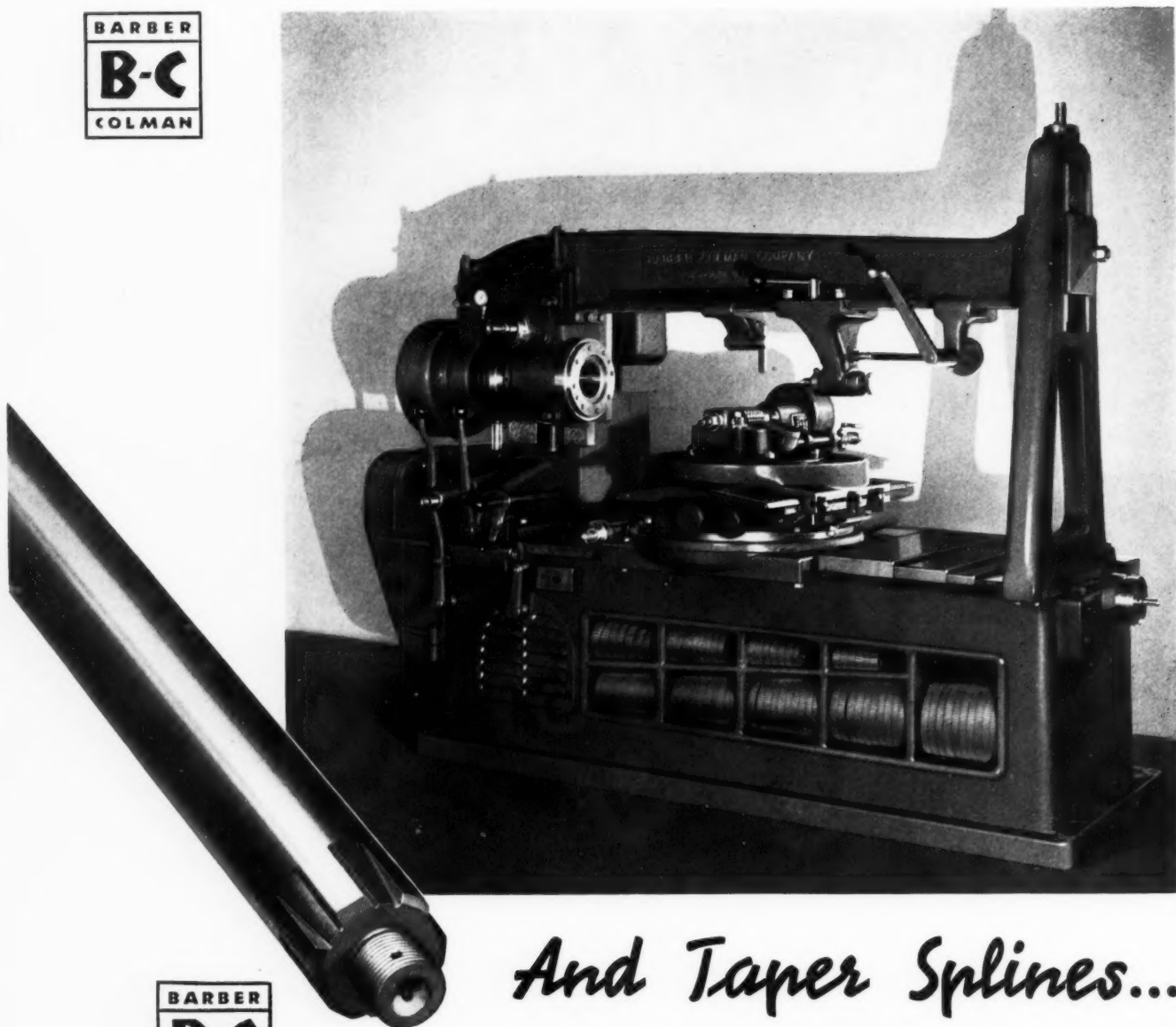
Self-Oiling, All-Geared

BARNES DRILL CO.

814 Chestnut Street, Rockford, Illinois, U. S. A.

MADE IN ROCKFORD, ILLINOIS, U. S. A.

Type T Hobbing Machine



And Taper Splines...

Here's a better way of mounting machine members on shaft ends. In the hub you ream a taper hole, pull through a multiple spline broach. On the shaft-end you hob mating taper splines with a B-C Type T Hobbing Machine. As compared to other methods, these operations are simpler, easier, more rapid, more accurate. The Barber-Colman Taper Spline is much stronger, more reliable, more durable, has greater contact area, seats solidly. You get a better product at low cost — and you can also use the Type T Hobbing Machine for all other kinds of hobbing work. Investigate! Test a Barber-Colman taper spline on one of your own shafts. We'll do the hobbing and broach the mating part, free, on stock sizes. Write today for list of hobs available and complete information on our Type T Hobbing Machine.



PRODUCTS

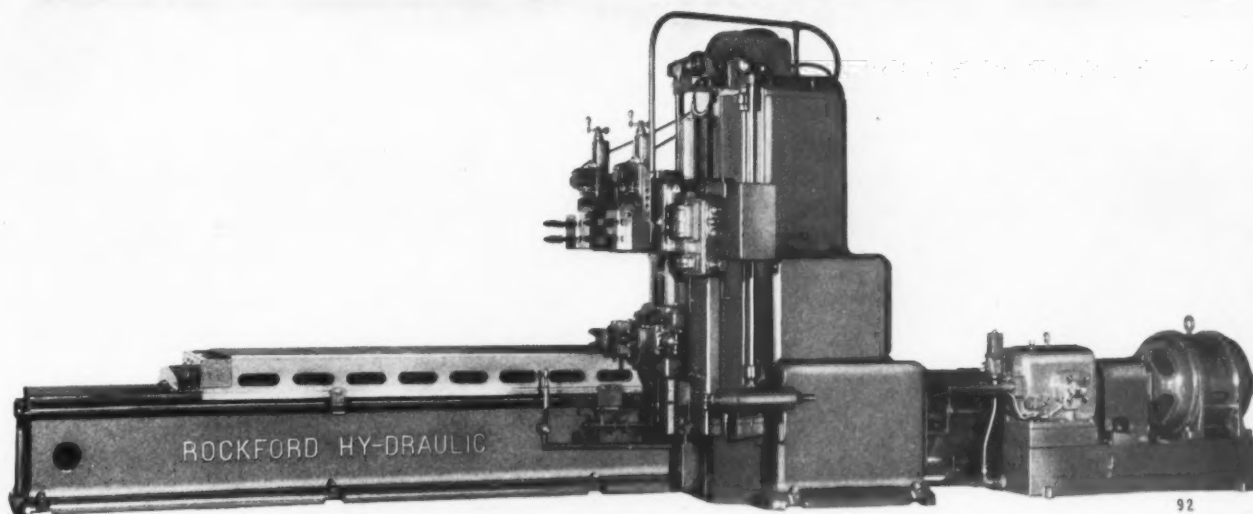
MILLING CUTTERS,
HOBS, HOBGING
MACHINES, HOB
SHARPENING MA-
CHINES, REAMERS,
REAMER SHARP-
ENING MACHINES,
SPECIAL TOOLS

BARBER-COLMAN COMPANY

General Offices and Plant ROCKFORD, ILLINOIS, U. S. A.

MADE IN ROCKFORD, ILLINOIS, U. S. A.

March 1937—August, 1938



ADVANTAGES

Of The

Hy-Draulic PLANER

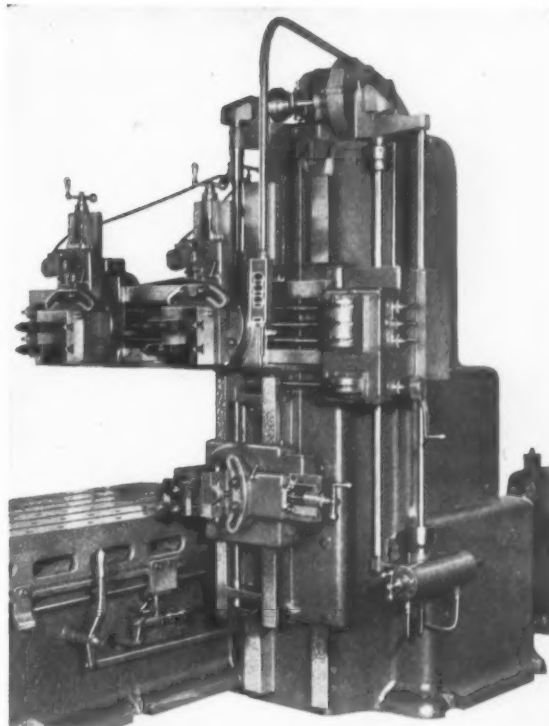
Constant Speed Drive—The Hy-Draulic table drive employs a standard constant-speed motor directly connected to the hydraulic unit, does not require a regenerative set, eliminates excessive power peaks.

Fine Finish, High Accuracy—In the Hy-Draulic table drive there are no gears, racks, or worms to transmit marks to the work. Finish is superior to any heretofore obtainable, being smooth, uniform, without blemish. Work produced by the Hy-Draulic Planer meets the most exacting requirements for accuracy.

High Production—Hy-Draulic cutting speeds and return speeds rise almost instantly to the exact rate selected and this is maintained constantly throughout the stroke. The right combination of hydraulic feed, cutting speed, and return, for maximum production on any piece of work, can be obtained instantly. Controls are few, simple, anyone can operate them.

Longer Tool Life—The Hy-Draulic drive lengthens life of cutting edges between grinds an average of 50%.

Longer Machine Life—Simplicity and ruggedness of design, relatively small number of moving parts, complete lubrication, high grade materials and workmanship throughout, all combine to provide longer machine life with lower operating and maintenance cost.



Send for New Bulletin

Only a few of the more important advantages of the Hy-Draulic Planer are indicated at left. Complete information, and specifications, are contained in a new bulletin that will be sent postpaid promptly on request—write for a copy today.

Hy-Draulic Shapers · Shaper-Planers · Planers
ROCKFORD MACHINE TOOL CO.
 ROCKFORD, ILLINOIS, U. S. A.

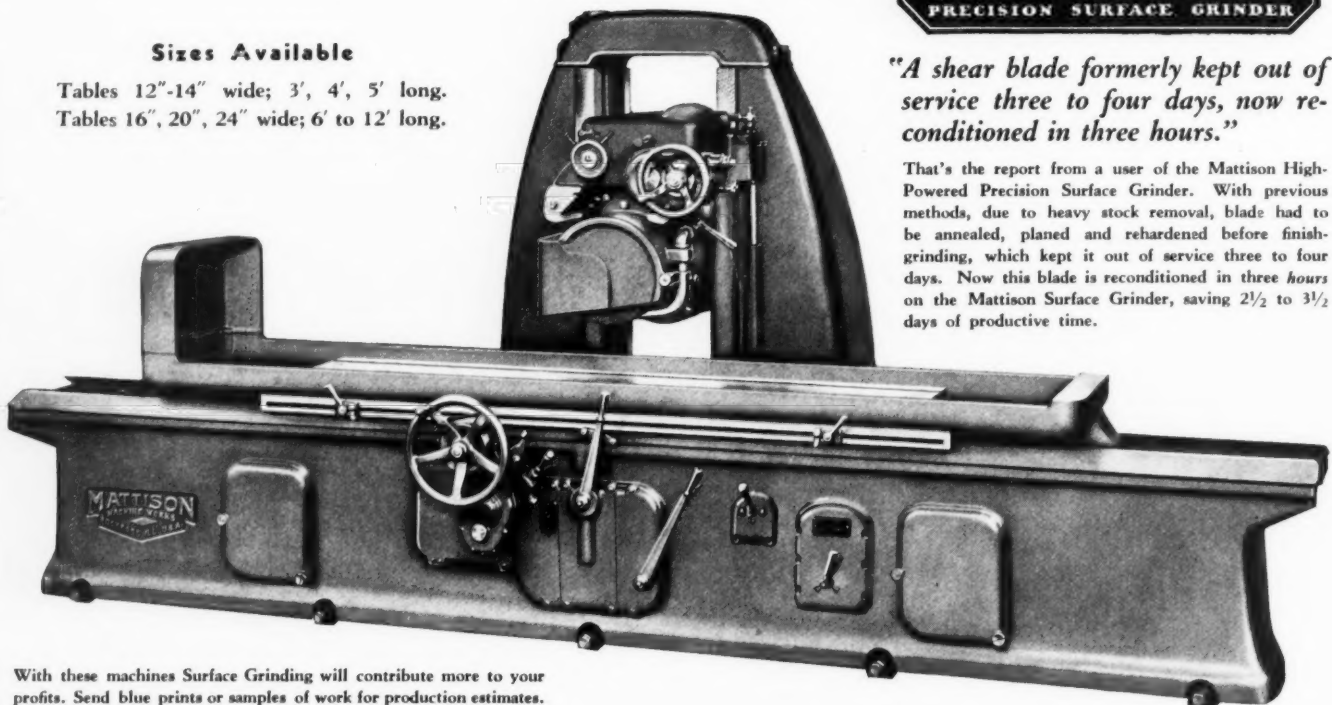
MADE IN ROCKFORD, ILLINOIS, U. S. A.

2½ Days saved by



Sizes Available

Tables 12"-14" wide; 3', 4', 5' long.
Tables 16", 20", 24" wide; 6' to 12' long.



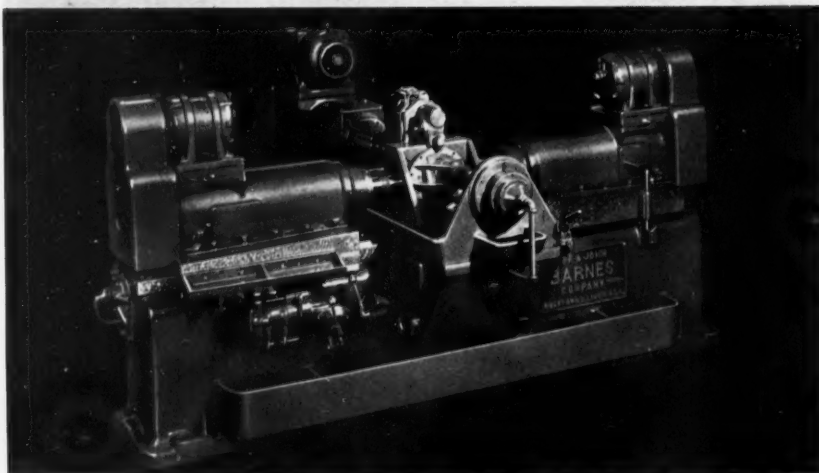
"A shear blade formerly kept out of service three to four days, now reconditioned in three hours."

That's the report from a user of the Mattison High-Powered Precision Surface Grinder. With previous methods, due to heavy stock removal, blade had to be annealed, planed and rehardened before finish-grinding, which kept it out of service three to four days. Now this blade is reconditioned in three hours on the Mattison Surface Grinder, saving 2½ to 3½ days of productive time.

With these machines Surface Grinding will contribute more to your profits. Send blue prints or samples of work for production estimates.

MATTISON MACHINE WORKS—ROCKFORD, ILLINOIS

ADVANTAGES OF BARNES 3-WAY SINGLE-POINT PRECISION BORING AND HYDRAULIC FEEDS



Again the superiority of single-point boring and Barnes Hydraulic Feed is demonstrated. This time in the 3-way horizontal machine illustrated. Operations are boring two cross holes and the pinion hole in malleable iron differential carriers.

Each head on the machine has a precision-type spindle and direct motor-drive through Vee belts. All heads have central control, slide on Vee and flat ways, have automatic operating cycle actuated by a Barnes FT Hydraulic Feed Unit. Fixture has accurate locating means on which work-pieces are held securely by a pneumatic clamp. These features, and the use of single-point boring tools, provide high accuracy, excellent finish and high production at low cost.

Barnes Hydraulic Units; and our extensive experience in their application; increase production, improve quality, and save money on a wide variety of drilling, boring, and similar operations. Investigate. Send drawings and data for reliable estimates on your work.

ESTABLISHED
1872



**ACCURATE, POWERFUL, ECONOMICAL
BORING and DRILLING MACHINES**

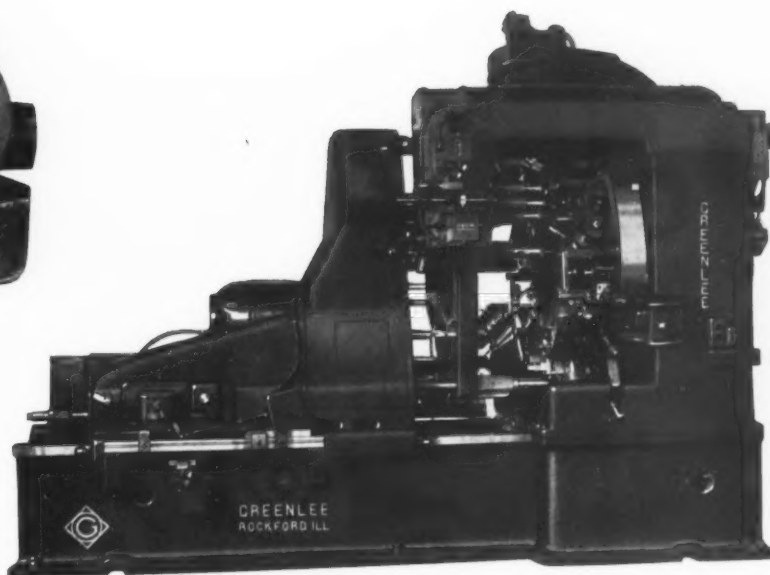
MADE IN ROCKFORD, ILLINOIS, U. S. A.

GREENLEE

Multiple-Spindle Machines



Right: Greenlee Horizontal and Angular Multiple-Spindle Hydraulic-Feed Drilling and Lead-Screw Tapping Machine, fitted with a 9-position automatic indexing turret for drilling, tapping, reaming, spot-facing, milling, counterboring and chamfering operations on the transmission rear bearing retainer, shown above.



Left: Greenlee Horizontal and Angular Multiple-Spindle Hydraulic-Feed Drilling and Lead-Screw Tapping Machine, fitted with a 6-position hand-indexing turret for drilling, tapping, reaming, milling and slotting operations on a transmission cover.



Continuously Accurate Fast . . . Dependable

Here are two machines that were built to meet the exact requirements of the customer. They are similar in their general design, but differ greatly in size and details. One is for machining an automobile transmission rear bearing retainer, the other for a transmission cover. Both provide the maximum in production efficiency, because of their continuous accuracy, and sturdy construction.

These machines are important because of the outstanding results obtained, but to the average machine tool user they are especially important because they are typical examples of Greenlee built-for-the-job equipment, which has found favor in so many plants. This means that regardless of the type of machine required or the part to be machined, you are assured of getting the very best in design and construction when you come to Greenlee.

You are invited to write for literature on Greenlee Machines. If preliminary estimates are wanted send blueprints of parts and production required.



GREENLEE BROS. & CO. ROCKFORD, ILLINOIS

MADE IN ROCKFORD, ILLINOIS, U. S. A.



ENGINEERED PRODUCTION

EXAMPLES FROM THE SUNDSTRAND FILES

No. 3616

Lathes
Milling Machines
Tool Grinders
Centering Machines
Balancing Tools

How Center Drive Provides Advantages On Model 10 Automatic Stub Lathe

Turning the rear axle shafts shown in Fig. 1 prior to grinding includes a straight diameter on one end and, on the other, a straight portion, a taper, a collar and a thread-diameter. The collar is

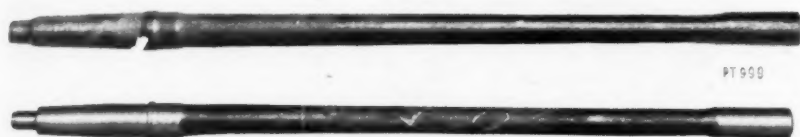


Fig. 1—Above, a rough axle shaft forging as it comes to the Sundstrand Model 10 Automatic Stub Lathe. Below it, a similar part after turning both ends simultaneously.

formed, with two radii; the thread diameter has a radius or groove at the shoulder, a chamfer at the end. The standard Sundstrand Model 10 Stub Lathe; with its ease of set-up, automatic operating cycle, cam bars for forming, and tool relief; is an excellent machine for these operations. Having extensive experience in this work, and in the de-

sign of center drives, our Engineered Production Department applied an overhead slide and center drive to the Model 10 Stub Lathe, as shown in Fig. 2. This arrangement turns both ends of a

shaft at one time, increases production, saves floor space, maintains required limits accurately, saves 50% of the operator's time, reduces capital investment. These lathes can be applied easily to other double-end turning, or center-drive and overhead slide

can be removed so that the machines can be tooled for a wide variety of different work.

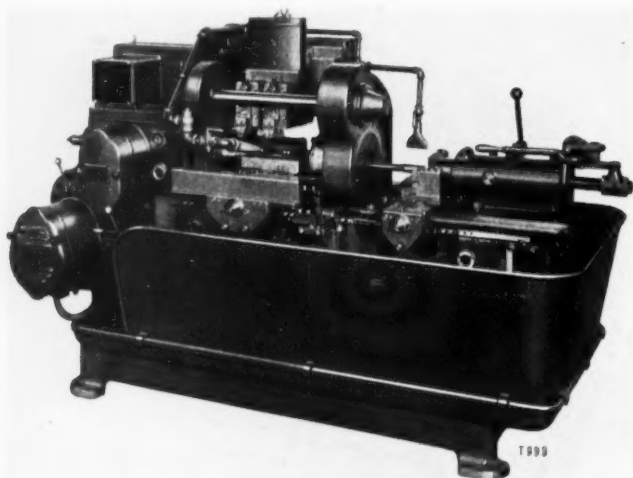


Fig. 2—Sundstrand Model 10 Automatic Stub Lathe, with center drive and overhead slide, for turning axle shafts.

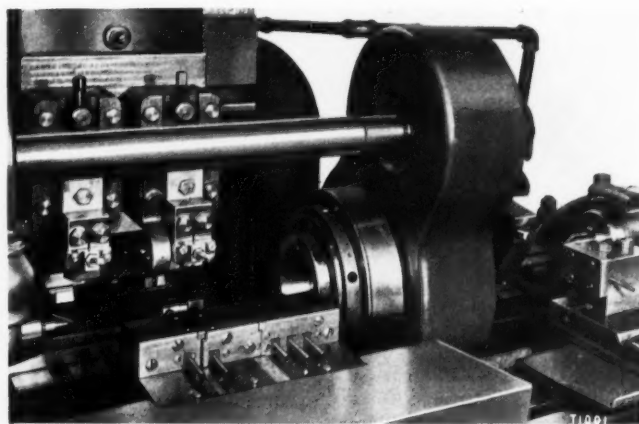


Fig. 3—Close-up of center drive, overhead slide, and tooling for turning axle shafts.

Investigate. Write today for literature on Sundstrand Stub Lathes. Send drawings and data for a reliable Engineered Production estimate.

SUNDSTRAND MACHINE TOOL CO.
2530 Eleventh Street, ROCKFORD, ILLINOIS, U. S. A.

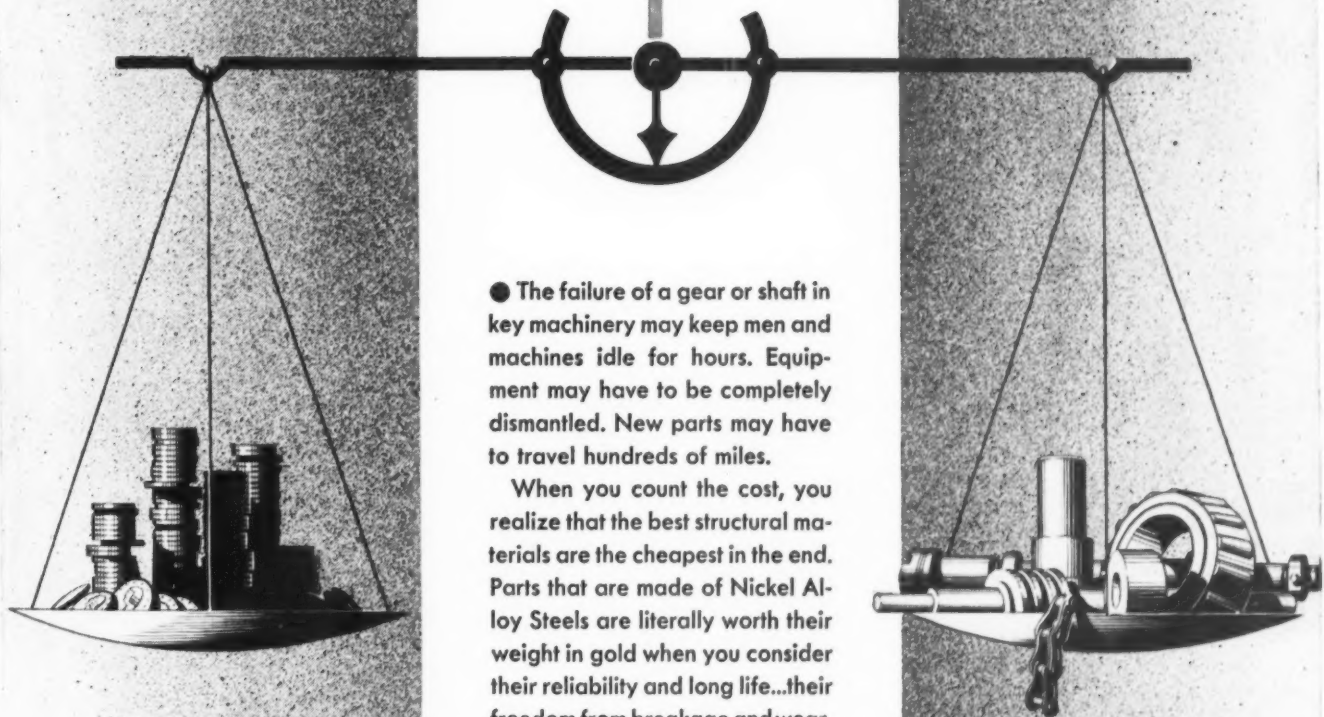
RIGIDMILS - STUB LATHES

3-Wheel Tool Grinders - Centering Machines
Hydraulic Operating Equipment - Special Machinery



MADE IN ROCKFORD, ILLINOIS, U. S. A.

WORTH THEIR WEIGHT IN GOLD TO ANY MANUFACTURER



● The failure of a gear or shaft in key machinery may keep men and machines idle for hours. Equipment may have to be completely dismantled. New parts may have to travel hundreds of miles.

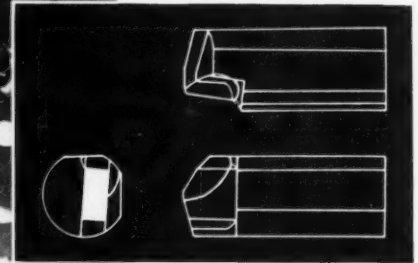
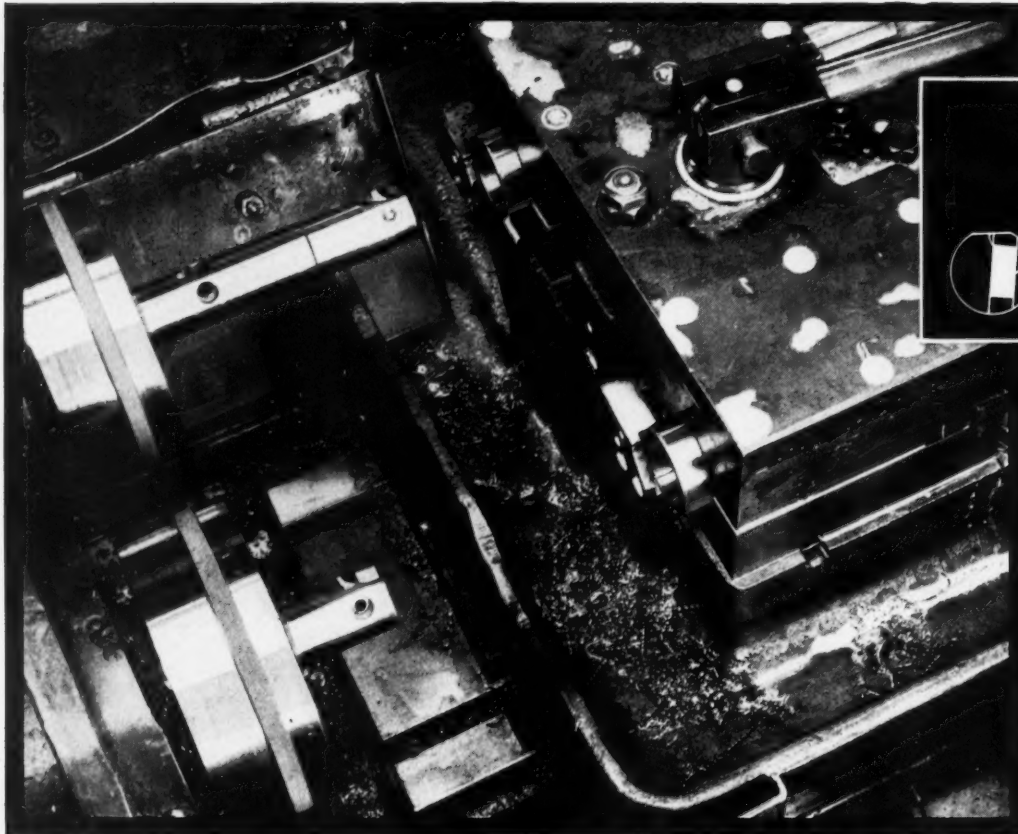
When you count the cost, you realize that the best structural materials are the cheapest in the end. Parts that are made of Nickel Alloy Steels are literally worth their weight in gold when you consider their reliability and long life...their freedom from breakage and wear.

When Nickel is alloyed with steel the result is vastly increased toughness and strength...higher resistance to shock, stress, fatigue, abrasion and wear. Our experience in the application of Nickel to industrial problems is at your disposal. Send for List "A" of available publications on Nickel and its alloys.

NICKEL ALLOY STEELS

THE INTERNATIONAL NICKEL COMPANY, INC.

NEW YORK, N. Y.



Tool used in this operation. Vascoloy-Ramet Grade DD for fast, light cutting to accurate size on both hard and soft steel.

*Precision boring torque tube, bearing diameter. Material: heat treated S.A.E. 1020 steel.
Performance of Vascoloy-Ramet tool:*

Feet Per Minute	Feed Per Revolution	Depth of Cut	Length of Cut	Pieces Per Grind
400	.007	.010 to .015	1 $\frac{3}{4}$ "	350

Grade DD! New! Stronger! Faster!
This amazing new grade of Vascoloy-Ramet is rapidly supplanting other tool materials for high precision machining of steels.

Indicative of its many industrial applications is its superiority in finishing connecting rods, stainless steel valve seats, torque tubes and other automotive parts.

The fifteen grades of Vascoloy-Ramet, the tantalum carbide hard alloy, cover the complete range of machining needs.

Unrivalled in the machining of all steel from the softest to the hardest alloys, Vascoloy-Ramet alone is capable of turning steel without "cra-tering."

On cast iron, semi-steel and non-ferrous materials, its performance is exceptional.

The new Vascoloy-Ramet catalogue price-list will be gladly sent upon request.

VANADIUM-ALLOYS STEEL CO.
VASCOLOY-RAMET DIVISION, NORTH CHICAGO, ILL.

VASCOLOY-RAMET

...The TANTALUM CARBIDE TOOL MATERIAL...



A GRADE FOR EVERY USE

District Sales Offices:

Pittsburgh Pa.
New York N. Y.
Springfield Mass.
Providence R. I.
Cleveland Ohio
Detroit Mich.
Chicago Ill.
St. Louis Mo.
Buffalo N. Y.
Newark N. J.
Knoxville Tenn.
Los Angeles Calif.
San Francisco Calif.



**When We Need
Good Steel**

Quickly

We depend on

**RYERSON
STEEL-SERVICE**

S.A.E. Hot and Cold Rolled Alloys, Stain-
less, Tool Steel, Screw Stock, Shapes,
Sheets, Plates, Bars, Welding Rod, etc.,
in stock for IMMEDIATE SHIPMENT.

•

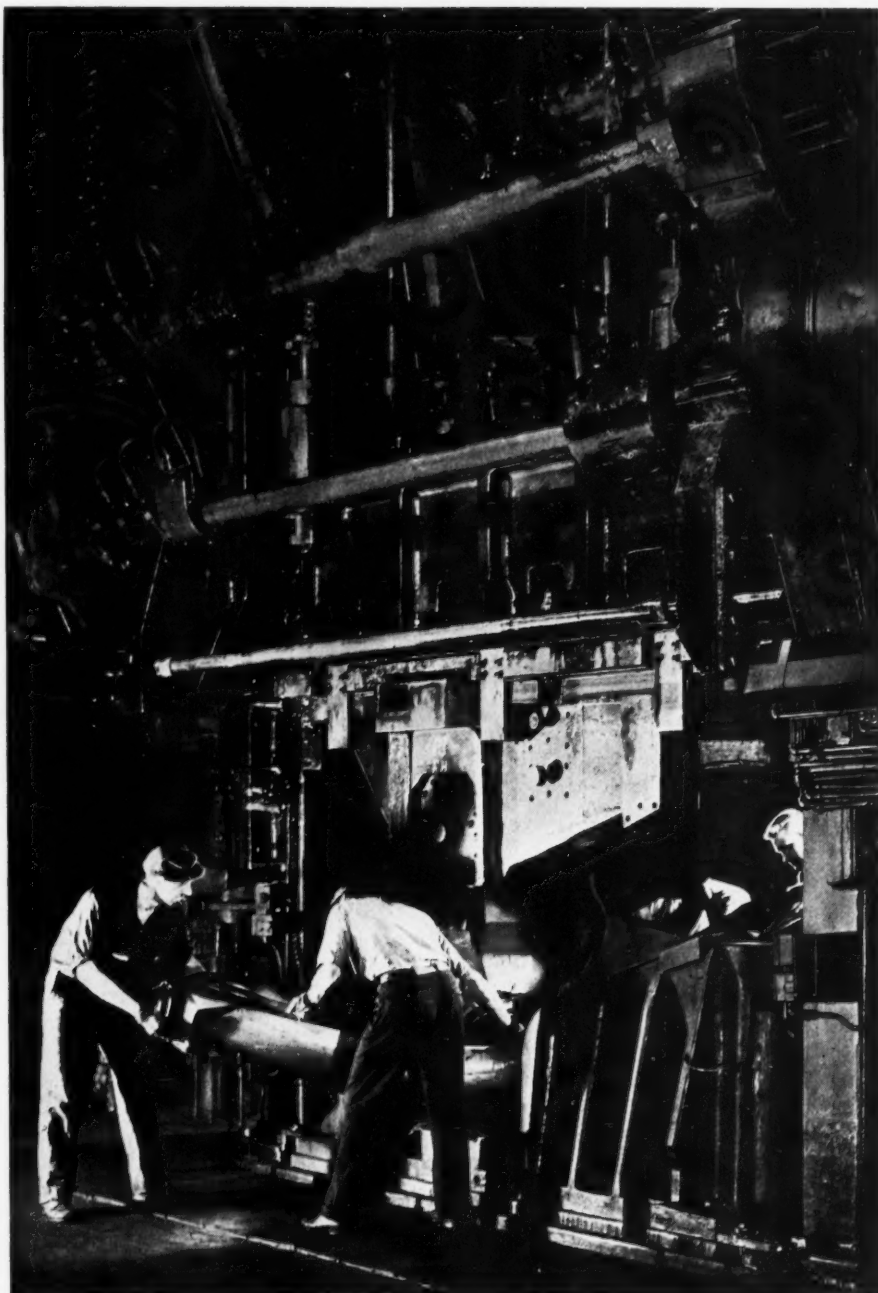
JOSEPH T. RYERSON & SON, INC., CHICAGO
MILWAUKEE • ST. LOUIS • CINCINNATI • DETROIT
CLEVELAND • BUFFALO • BOSTON
PHILADELPHIA • JERSEY CITY

IT TAKES THESE *better* SHEETS TO PRODUCE TODAY'S FINE CARS

TODAY'S new designs in automobiles call for lots of steel... good steel. Steel that is uniform and ductile enough to stand tons of pressure from giant two story-high presses; steel that can be formed into deep fenders, bigger body panels and high crowned all steel tops; steel that will withstand the entire tortuous grind of automobile manufacturing machinery and come out faultlessly smooth, ready to take a fine, beautiful finish.

We make such steel. Our metallurgists stand ready as they have in the past to help the forward movement of the great automotive industry by making new steels to meet new demands. Our craftsmen know how to produce steel sheets that are ductile and strong.

American Steel Sheets have helped make today's finer, safer, better looking automobiles possible. For consistently strong, ductile, uniform steel sheets that will take a smooth finish use American Steel Sheets.



AMERICAN STEEL SHEETS

CARNEGIE-ILLINOIS STEEL CORPORATION • *Pittsburgh and Chicago*

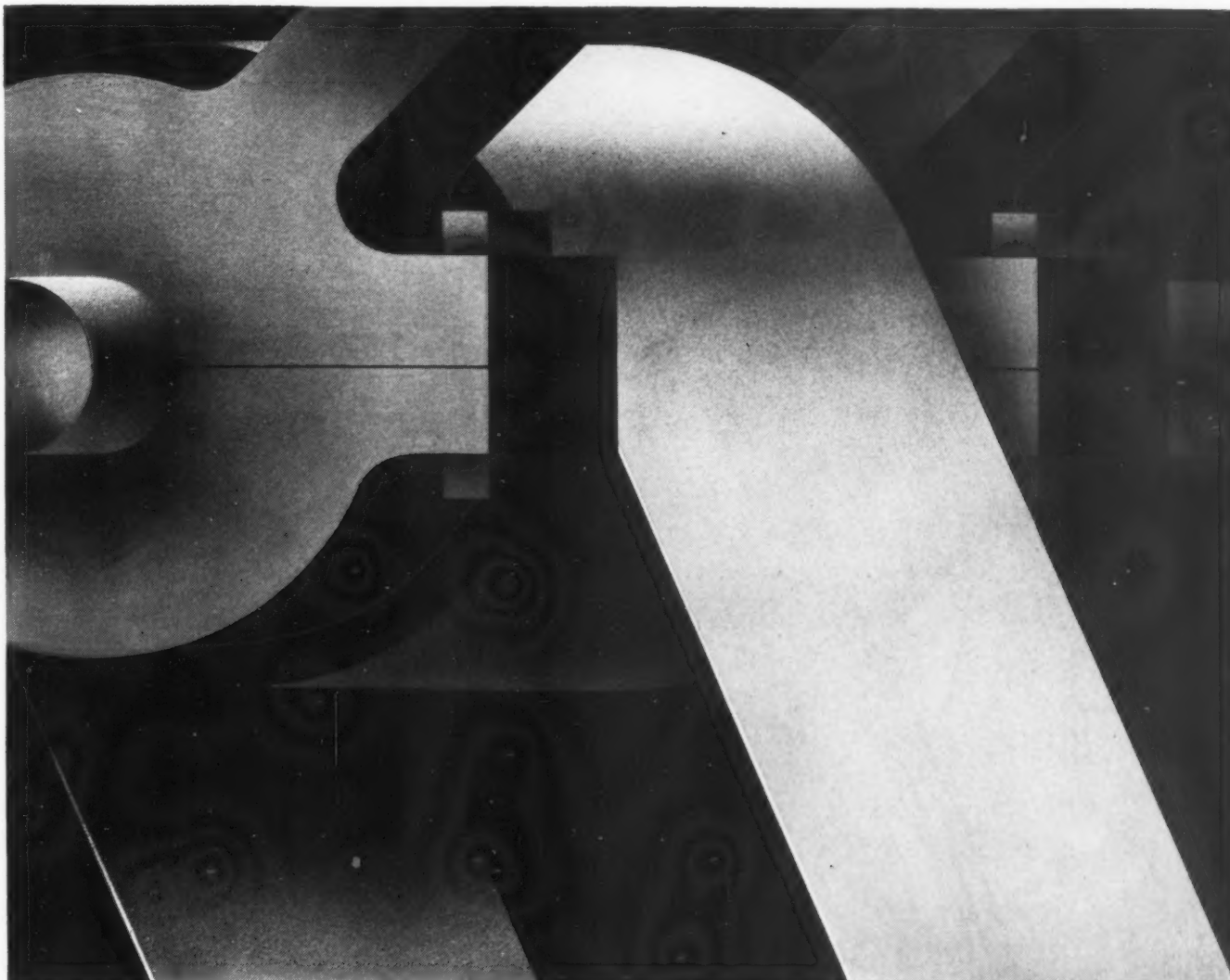
With which has been consolidated American Sheet and Tin Plate Company

Columbia Steel Company, San Francisco, *Pacific Coast Distributors*



United States Steel Products Company, New York, *Export Distributors*

UNITED STATES STEEL



MOLY for WEAR

WHENEVER a product is faced with stiff operating requirements, price is not the final measure of its value or economy. "How well will it wear? How long will it last?" Its answers are the real sales-closing factors.

A manufacturer of fuel-oil pumps found that out. His competitive success, he discovered, depended on the steel he selected for rotors. It had to have exceptional hardness to resist wear and to combat the corrosive effects of various types of fuel oils.

A Chrome-Moly (SAE 4130) cyanided rotor was the solution. Not only was it found to take an extremely hard case, but it involved less hardening and machining costs. Thus, while searching for one

advantage, two were found, viz., higher quality and lower production cost.

Your problems may be simpler. Or they may be even more complicated. In either case, it will pay you to investigate Moly steels. Their almost limitless range of applications is envisioned in our technical book, "Molybdenum." We invite engineers and production heads to write for it. Also ask to be placed on the mailing list of our periodical news-sheet, "The Moly Matrix." And — if you've a peculiar alloy problem needing further study, our experimental laboratory facilities are at your command. Climax Molybdenum Company, 500 Fifth Ave., New York City.

MOLY SALES
CUTS COSTS



MIRROR FINISH - SHAFTS -

Turned, then precision ground to a smooth, mirror-like finish—practically eliminating surface tension—CUMBERLAND Shafts are dependable, accurate, and of uniformly high quality. Straight and concentric, they can be assembled in machines in minimum time . . . cause no costly production delays to ream, file, or fit. And, too, they are recognized universally as quality shafts . . . are a real selling feature in any machine in which they are used.

Investigate CUMBERLAND quality, today! Write for your copy of our new folder . . . you'll want it for your files.

. . .

NOTE: We also make the following Brands of shafts . . . "POTOMAC"—Yield Point 40,000 lbs. Min. Tensile strength 70,000 lbs. Min. "CUMSCO"—Yield Point 55,000 lbs. Min. Tensile strength 90,000 lbs. Min.

TOLERANCES	
SPECIAL	
(Any Diameter)	
LIMITS $\pm 0.0005''$	
or any other total tolerance of 0.001''	
STANDARD	
Small Dia. {	+0.000'' -0.002''
Large Dia. {	+0.000'' -0.003''

CUMBERLAND STEEL COMPANY

CUMBERLAND, MARYLAND, U.S.A.

"Quality Shafting for Over 50 Years"

An Unusual Case Study

in Simplified Production...

ANY production or machine shop foreman will be amply repaid for giving a few minutes study to the three-part Bakelite Molded housing shown here.

First, examine the unusual interior form and contours of the two upright halves. The recesses, lugs and posts were accurately formed and positioned, and metal inserts firmly embedded in one closing of the molding press. The same operation formed the grooves in the base for holding the flat Bakelite Molded bottom, which is completed in another molding operation, with all required lettering in clear relief.

The exterior of this product also presents interesting production features. Notice the fine lustre of all surfaces; the embossed lettering and trade-mark; and the stippling that



provides a grip for the user's hand. These were imparted in the molding process, and required no further finishing or polishing. In addition, this Bakelite Molded construction permits quick, complete assembly with four screws.

The unusual characteristics of this material adapt it to an endless variety of uses in other devices, appliances and machine parts. Bakelite Molded combines strength, dur-

ability, fine appearance, important electrical properties and resistance to moisture, chemicals, solvents and abrasion. It is available in a wide selection of colors.

It will pay you to learn more about this useful material. Write for our illustrated booklet 30M, "Bakelite Molded".

Photographs show the "Life Lite" ultra-violet ray lamp housing, made by Ultra-Violet Products, Inc., Los Angeles, Cal.

BAKELITE CORPORATION, 247 PARK AVENUE, NEW YORK, N. Y.
BAKELITE CORPORATION OF CANADA, LIMITED, 163 Dufferin Street, Toronto, Ontario, Canada

BAKELITE

The registered trade marks shown above distinguish material manufactured by Bakelite Corporation. Under the capital "B" is the numerical sign for infinity, or unlimited quantity. It symbolizes the infinite number of present and future uses of Bakelite Corporation's products.

THE MATERIAL OF A THOUSAND USES

MACHINERY, August, 1936—81



you say - STAINLESS SCREWS AND FASTENINGS THROUGHOUT?

There is no better pledge of the quality of your product than the simple statement, "Stainless screws and fastenings throughout".

With these few words you give your prospect a world of information. Instantly, he knows that here is a better - than - ordinary product - that its beauty is more than skin-deep - that its quality reaches even to the smallest detail.

Modern products call for these modern fastenings that last as long as the product itself. Stainless screws look nice and stay that way. Neither screw driver nor wear can make the fine finish peel or rub off. Freedom from corrosion makes it

easy to remove them when necessary. Of course, Stainless screws cost more - and they're worth it! Remember, though, the cost of any screws is mighty small compared to the cost of the product itself. And yet one rusty screw can mar the whole appearance of an otherwise beautiful product.

For many purposes - even out-of-doors - it is not necessary to use the most expensive types of Stainless steels. We will gladly assist you in selecting the proper type and tell you where you can get Stainless screws and fastenings for your purpose. Mail the coupon today. The Carpenter Steel Company, Reading, Pa.



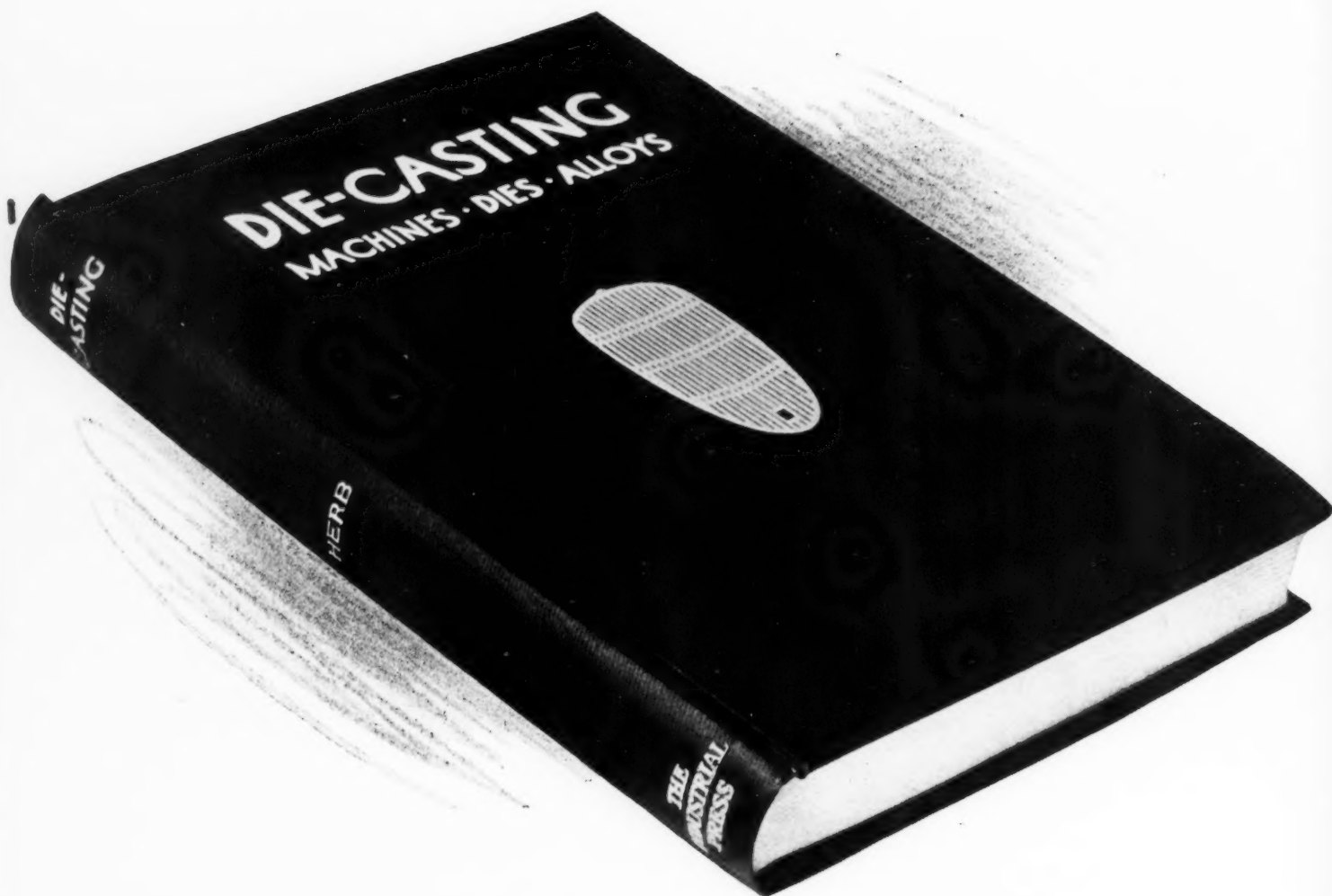
THE CARPENTER STEEL COMPANY

READING, PENNA.

Please note--The Carpenter Steel Company does not make Stainless screws and fastenings. It does furnish stainless Steel to screw manufacturers.

Licence of Chemical Foundation, Inc.

THE CARPENTER STEEL COMPANY
105 West Bern Street, Reading, Pa.
Please send me more information on the use of Stainless fastenings for the following purpose: _____
NAME _____ FIRM _____ ADDRESS _____ CITY _____ STATE _____
TITLE _____
(FIRM NAME MUST BE GIVEN)



MACHINERY'S NEW BOOK—

**for Everyone Interested in a Complete
Treatise on Die-Casting . . .**

This book deals with die-casting machines from the earliest to the latest types, with the design of dies from the simplest to the most highly developed, with die-designing standards, with various die-casting alloys, and contains fully illustrated descriptions of a large number of die-casting operations, including the die-casting of brass and even the very recently developed process of die-casting cast iron. A general idea of the scope and practical value of this new book may be obtained from the list of contents on the next page.

THIS BOOK ON DIE-CASTING

has 300 pages (6 by 9 inches) of thoroughly practical information with 178 drawings and photographs of dies, machines, die-casting operations, and examples of die-cast parts of numerous shapes and sizes. Here is a List of the General Subjects:

Die-Casting Process and Its Applications

The Die-Casting Process Defined; Developments in Die-Casting; Applications of Die-Castings; Miscellaneous Examples of Die-Casting.

Die-Casting Machines and Their Development

Origin of Die-Casting and Early Types of Machines; Die-Casting Machine Patented in 1849, in 1852, in 1872; First Machine Designed for Miscellaneous Work; Pneumatic Die-Casting Machine Patented in 1907; First Commercial Die-Casting Machine; Modern Commercial Die-Casting Machines; Small Hand-, Foot-, and Air-Operated Semi-Automatic Machines; Vertical Machine for Casting Around Inserts; Automatic Die-Casting Machines; Hydraulically Operated, Automatic Die-Casting Machine; Brass Die-Casting Machines.

Alloys for Die-Castings

Properties of Zinc-Base Die-Castings; Effect of Tin and Other Impurities in Zinc Die-Castings; Aluminum-Base Alloys; Copper-Base Alloys; Lead-Base Alloys; Magnesium-Base Alloys; Tin-Base Alloys.

Die-Casting Dies and Their Operation

General Requirements of Die-Casting Dies; Simple Type of Die-Casting Die Illustrating Operating Principles; How the Casting is Ejected from the Die; Parting Line Between the Fixed and Movable Dies; Vents for Escape of Air as Metal Enters Die; Die Equipped with Core-Pulling Mechanism; Dies of Various Designs; Accuracy of Die-Castings.

Two or More Castings at Each "Shot"

Die-Casting Two Parts Simultaneously; Multiple Dies Equipped with Interlocking Cores; Dies for Casting 128 Cups a Minute; Eighteen Parts Cast at Each "Shot"; Operating Eighteen Cores; Four Die-Castings of Different Design from One Set of Dies.

Dies with Auxiliary Slides for Exterior Cores

Examples of Under-Cut Die-Casting which Requires Sliding Die Parts; Intricate Die for Carburetor Casting; Core-Operating Mechanism; Cores for Holes in Angular Position; Cores for Outside Pockets; Dies for Air Horn of Carburetor; Water-Cooled Core; An Ejector Sleeve Used Instead of Pins; Operation of Auxiliary Slides.

Sliding Cores in Movable and Stationary Dies

Rack-and-Pinion Mechanisms Move Long Slender Cores; Casting Ejected at an Angle from the Horizontal; Sliding Cores of the Stationary Die; Cores in Movable and Stationary Dies which Must Register Accurately; How the Sliding Core of the Stationary Die is Operated; Operating the Sliding Cores of the Movable Die; Die Set with One Hundred and Thirty-six Moving Cores.

Adjustable Dies for Parts of Different Dimensions

Adjustable Dies for Typewriter Top Plates; Tolerances for the Cored Holes; Locating the Parting Line; Ejecting the

Casting; Adjustable Dies for Step Plates of Different Widths.

Standards for Designing Die-Casting Dies

Ejectors of Different Types; Locking Devices; Guide Pins and Blocks to Insure Accurate Registry; Core-operating Mechanisms and other Standardized Features.

Steels Used for Die-Casting Dies

Steel for Metals of Low Melting Points; Dies for Aluminum Castings Must Possess High Heat-Resisting Qualities; Failure from Heat Checking and Cleavage Cracking; Cleanliness and Uniformity are Essential in Die Steels; Semi-High-Speed Steel for Brass Die-Castings; Heat-Treatment of Die Steels.

Die-Casting with Machines of Simple Design

Operation of Semi-Automatic Machine; Sixteen Hundred Die-Castings an Hour with Semi-Automatic Equipment; Spherical Segment-Shaped Zinc Die-Castings; Casting Three Parts of Different Shape in One Die; Lead Battery Nuts Having Double Internal Thread; Lead Terminals Cast on Insulated Wire Cables; Steel Insert in Casting.

Die-Casting Thin Sections

Examples of Casting Thin Walls; Die-Casting an Oil-Burner Float-Valve; Gating the Dies; Operation of Dies; Ejection of the Casting; Rate of Production; Die-Casting with Walls 1/16 Inch Thick.

Brass Die-Casting Process

Advantages of Brass Die-Castings; Brass Die-Castings Versus Brass Forgings; Applications of Brass Die-Castings; Casting the Metal while in a Semi-Liquid or Plastic Condition; General Method of Operating Polak Machine; How the Plastic Metal is Forced into the Die-Cavity; Hydraulic Pressure System for Operating the Machines; Casting Capacities of Different Machines and Rate of Casting; Alloys Used for Brass Die-Castings; The Dies Used in Brass Die-Casting.

Die-Casting Aluminum Bronze by Vacuum Process

Principle of the Vacuum Process; Melting Temperatures; Risers to Supply Excess Metal and Compensate for Shrinkage; Uses of Typical Aluminum-Bronze Die-Castings.

Unit System of Die-Casting

Dies and Die-Holder of the Unit System; Quick-Change Feature of Die Units; Unit Die System Permits Economical Use of Larger Machines; Features of Die-Holder Construction; Methods of Operating Ejector-Pins and Cores.

Die-Casting Cast Iron

Examples of Cast-Iron Die-Castings; Cast Iron Die-Cast on Steel Inserts; Equipment for Die-Casting Cast Iron; How the Die-Casting of Cast Iron is Done; The Melting Furnace Used for Cast-Iron Die-Casting; Dies Used in Die-Casting Cast Iron.

ORDER FORM

THE INDUSTRIAL PRESS

148 Lafayette St., New York.

Send me, postpaid, a copy of the new book Die-Casting. Within 5 days after receipt of book I will either send you \$3 or return the book—or I enclose \$3 herewith.

NAME

HOME ADDRESS

CITY AND STATE

* FIRM

* POSITION

*This additional information for our private records would be appreciated

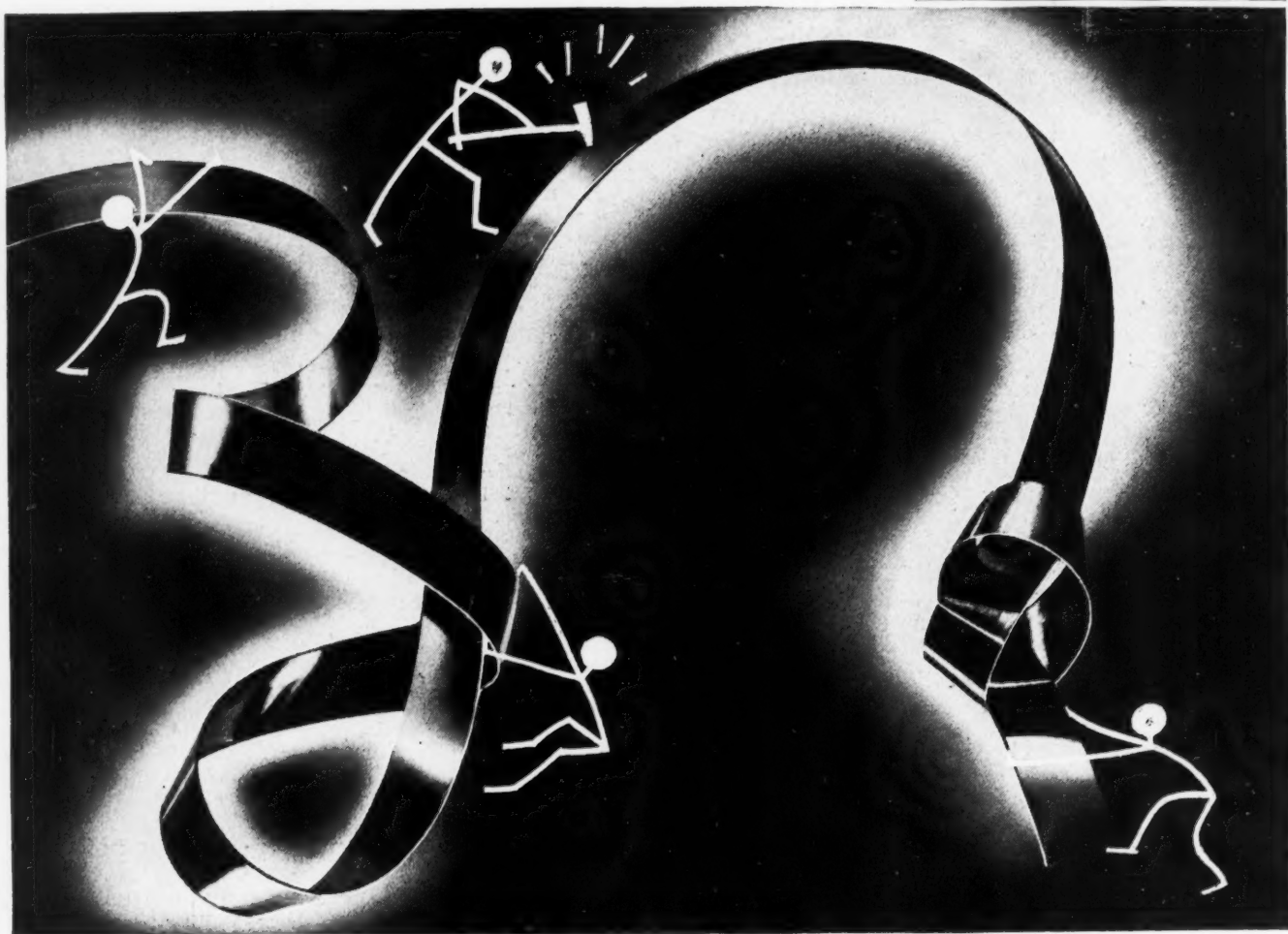
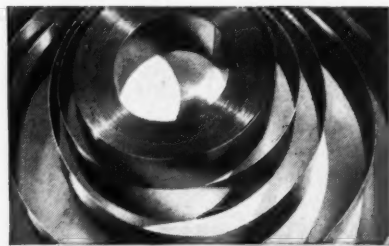
M-8/36

Book Sent On
Approval Without
Advance Payment

Price
\$3.00

Punishment...

AND IT SURE MUST "TAKE IT"



HERE is a cold-rolled high carbon "flat", tempered, polished, and blued, that is made to take a beating in service...and to stand up under it. In use, it's yanked around, coiled, tangled, bent. But it must stay durable and useable.

As you can well imagine, this wire must have plenty of toughness and resiliency. In addition it must be exceptionally accurate dimensionally and notably free of defects on the

surface and edges. It must have high tensile strength and a uniform temper, held within very close limits.

We specialize in making cold-rolled steel flat wire to meet a variety of severe requirements. Our organization is trained along custom-production lines to give this business the time and attention it demands. Our experience covers a period of over 40 years.

We invite your inquiry regarding any of the high or low carbon wire listed.



Roebling Cold Rolled Flat Wire is made from both high carbon and low carbon steels, produced in Roebling's own mills. The high carbon flat wire is available in tempered and untempered types.

Finishes:—bright, black annealed, bright annealed, tinned, japanned, galvanized, blued, straw-colored, coppered.

JOHN A. ROEBLING'S SONS COMPANY
TRENTON, N. J. *Branches in Principal Cities*

ROEBLING Cold Rolled Steel FLAT WIRE

ONLY A FINE PRODUCT MAY BEAR THE NAME ROEBLING



A
has a
er. It
night for
on each
have had
any kind.
second machine
on request).

Grinds Tungsten-Carbide
High Speed tools to exact
angles with sharp, smooth
edges. Double unit permits com-
plete grind without wheel change.

Available for both wet and dry
grinding.

Carbide) keep modern cutters,
reamers, mills, etc., producing
as good as (or better than)
new. THEY CURE PRODUC-
TION LAG due to tool and
cutter failure—THEY INSURE
ACCURACY—THEY PROLONG
TOOL LIFE—enable you to get
maximum results from your
tool investments.

THE OLIVER LINE—

Modern Tool Reconditioning Machines

- OLIVER AUTOMATIC FACE MILL GRINDER
- OLIVER No. 2 ARC FACE MILL GRINDER
- OLIVER TWIST DRILL POINTER OR GRINDER
- OLIVER TWIST DRILL POINT THINNER
- OLIVER TAP GRINDER
- NEW OLIVER UNIVERSAL TOOL AND CUTTER GRINDER
- OLIVER PRECISION TOOL GRINDER
- OLIVER-OF-ADRIAN DIE MAKING MACHINES



OLIVER UNIVERSAL TOOL AND CUTTER GRINDER

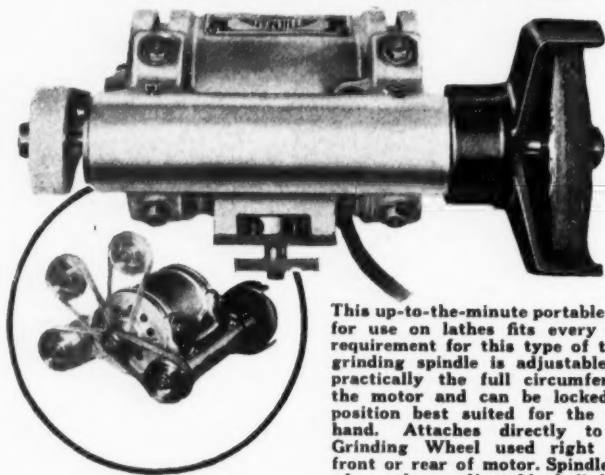
Specialized for grinding all types of
cutters, reamers, spot facers, end
mills, form cutters, side mills, face
mills, slab mills, etc. Fast and ac-
curate on all grinding operations.
Easy to understand—easy to set up
—easy to operate. Keeps cutting
tools SHARP at minimum cost.

Does Any Grinding Job—Fits Any Size Lathe

THE MAC

PORTABLE ELECTRIC GRINDER

Clean Design—Precision Built



Model J-4
\$125.00

This up-to-the-minute portable grinder for use on lathes fits every possible requirement for this type of tool. The grinding spindle is adjustable around practically the full circumference of the motor and can be locked in the position best suited for the work in hand. Attaches directly to T-slot. Grinding Wheel used right or left, front or rear of motor. Spindle mounted on three adjustable ball bearings. Model shown has 1/2 H.P. motor and uses wheels 3/8" to 4" diameter. Other models available with 1/3 H.P. from \$60.

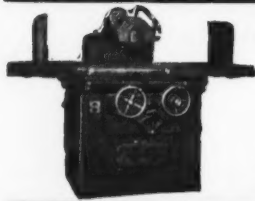
The McGonegal Mfg. Co., Rutherford, N. J.

ABRASIVE SURFACE GRINDER

HORIZONTAL
and
VERTICAL
for
TOOLROOM and
PRODUCTION

Write for Particulars

ABRASIVE MACHINE TOOL CO., East Providence, R. I.



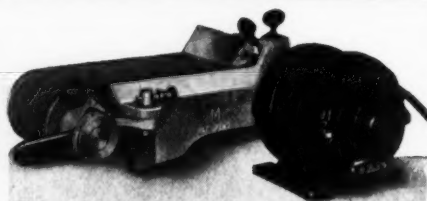
DIAMOND TYPE G SURFACE GRINDING MACHINE

A FAST, ACCURATE, AND COMPACT
MACHINE. WRITE FOR BULLETINS.

DIAMOND MACHINE CO., Providence, R. I.

NOW!

An
Inexpensive
ABRASIVE
BAND
GRINDER—



"Built Like a Machine Tool"

The Hormel-M Grinder is sturdily built with a supporting leg under the grinding table to eliminate vibration and tipping due to pressure on belt. Ball bearing throughout, equipped with Alemite lubrication, complete with grease gun. Write for illustrated folder on this and other styles and sizes.

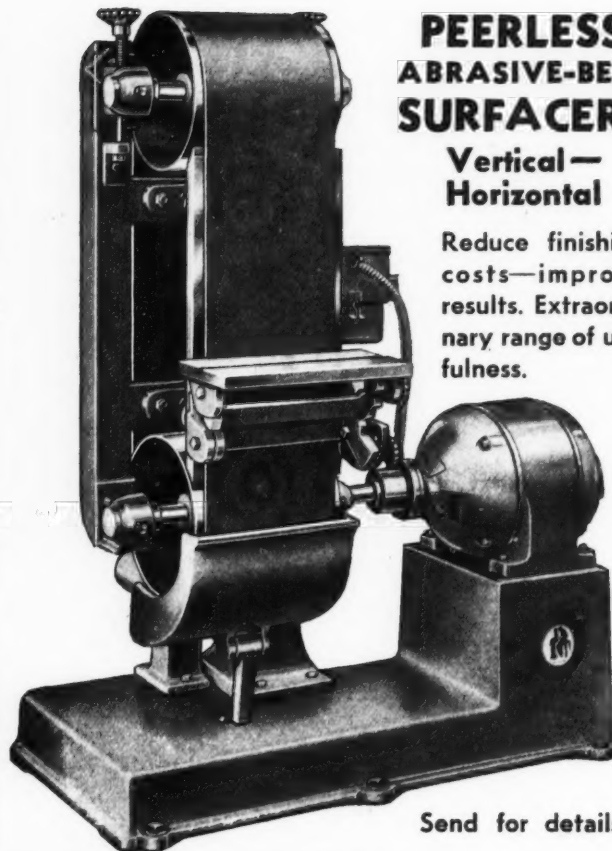
HORMEL-M GRINDER

WALLS SALES CORP., 96 Warren St., New York, N. Y.

PEERLESS ABRASIVE-BELT SURFACERS

Vertical—
Horizontal

Reduce finishing
costs—improve
results. Extraordi-
nary range of use-
fulness.



Send for details.

PRODUCTION MACHINE CO., GREENFIELD, MASS.

AGENTS—Mott & Merryweather Machinery Co., Cleveland, O., Pittsburgh, Pa., and Cincinnati, O. The Chas. A. Strelinger Co., Detroit, Mich. Mr. P. H. Arden, 565 W. Wash. Blvd., Chicago, Ill.



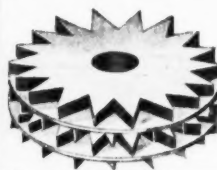
Combination Tap and Drill Grinder

No. 10B

Motor driven. No. 6 to 1 1/2", 1/8" to 1 1/2". Grinds Taps from Twist Drills.

A Grand Rapids Combination Tap and Drill Grinder does the work of two machines. It is rugged and fast enough for production grinding, occupies very little floor space, and is inexpensive to buy. If you grind both taps and drills, get full information. Write to Gallmeyer & Livingston Co., 344 Straight Ave., S. W., Grand Rapids, Mich.

Grand Rapids Grinders



No. 0 Desmond Cutters

GRINDING WHEEL DRESSERS and CUTTERS

Write for copy of Catalog "B" and name of your nearest dealer.

The Desmond-Stephan Mfg. Co.
Urbana, Ohio

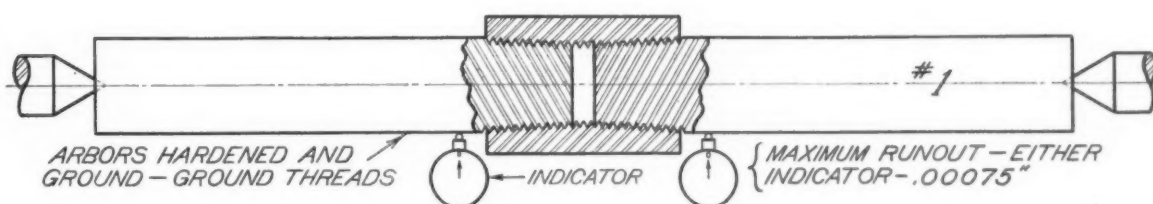
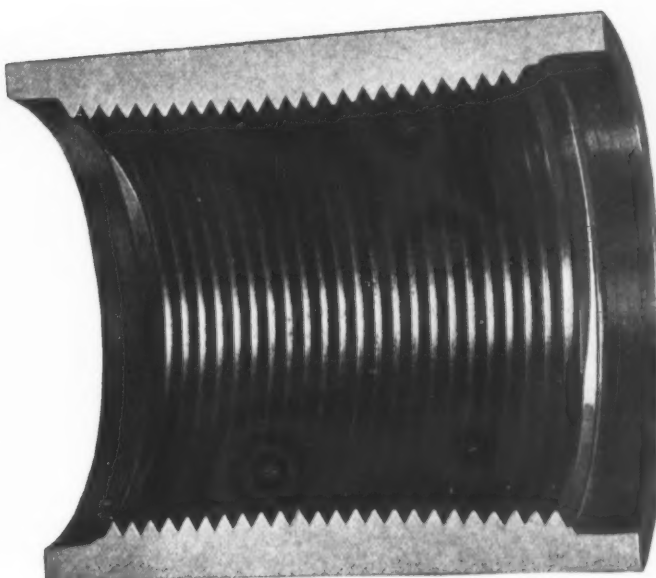
Just a Reminder—that HANCHETT GRINDERS



are built to remove metal in the modern way—with Precision—and to the Peak of Production! Investigate! It's worth your while.

HANCHETT MANUFACTURING CO.
BIG RAPIDS MICHIGAN

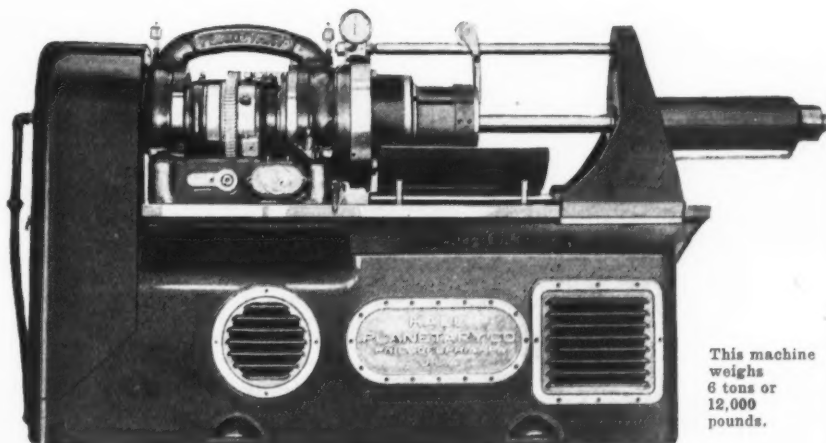
Planathreading Couplings with Results Not Obtainable by Any Other Method



The photograph shows a cross section of a coupling threaded by the Hall Planetary Method. Study it! Some of the 10 advantages inherent in Planathreaded Couplings are obvious—even in a photograph. Others require closer inspection to be appreciated. They are all there, all important and all contribute toward making the coupling that is Planathreaded A MUCH BETTER COUPLING—stronger, more nearly leak proof, at lower cost. Therefore—study the photograph of the coupling section; read the 10 Features—then write for complete details of the New Hall Planetary Method for threading couplings.

THE HALL PLANETARY COMPANY

FOX STREET AND ABBOTSFORD AVE.
PHILADELPHIA, PA.



This machine weighs 6 tons or 12,000 pounds.

10 ADVANTAGES IN PLANATHREADING COUPLINGS

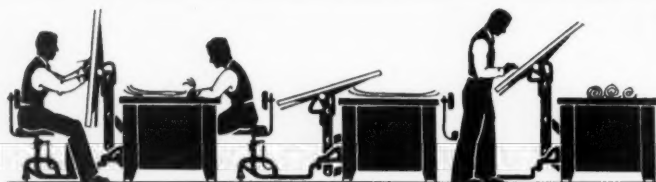
- 1 The counterbore at each end of the coupling is milled simultaneously with the thread—therefore thread and counterbore are absolutely concentric.
- 2 Threads are started with the "Planetary Approach"—eliminating the thin sharp starting edge of ordinary threads.
- 3 Threads meet in center making one continuous thread from end to end. Threads in both ends are in perfect alignment, taper is right—within .001" in 3".
- 4 Diameter can be held to a tolerance of .001" overall.
- 5 Form of thread is right—angle is practically perfect.
- 6 Threads per inch are within one-quarter of a thousandth (.00025") in 3".
- 7 Threads are concentric with the outside diameter of the coupling.
- 8 Threads are round within .00025".
- 9 Surface of thread is perfectly smooth and clean cut without tears.
- 10 We guarantee that rejects of Planathreaded couplings will not be more than 2%.

FREW "VEE-DRIV" HAND MILLER

Multi V-Belt Drive assures smooth, chatter-free milling. Motor mounted on tilting base—three instantaneous speed changes—Timken Roller Bearings—husky construction, modern in every particular. Also furnished with power feed to table. Every shop superintendent will want the details. Bulletin?



THE FREW MACHINE CO. 132 W. Venango St.
PHILADELPHIA, PA.



Auto-Shift Tables Reduce Costs

WRITE NOW
for our valuable
Drafting Room
Furniture
MANUAL

Mention your firm
name and your
title

Here is organized efficiency . . . each draftsman (as shown above) sits between two table units . . . his drafting board, instantly adjustable to any height or slant, is mounted on the unit ahead . . . his reference desk is conveniently located behind him. Creative draftsmen appreciate such modern facilities . . . they do more work, better, speedier . . . costs drop! Leading industrials have proved this. Send for facts.

HAMILTON MFG. CO.
TWO RIVERS, WISCONSIN

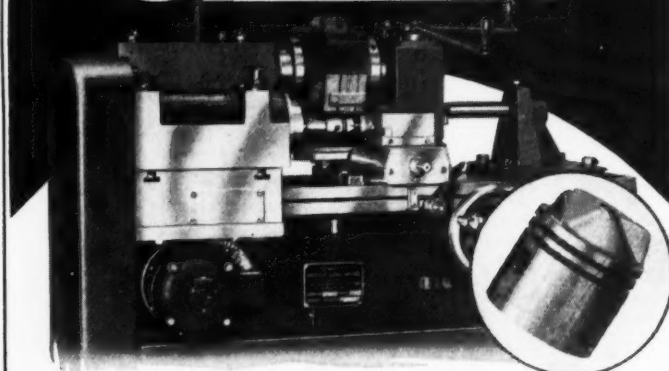
HAMILTON
Drafting Room FURNITURE

HAMILTON MFG. CO.
Two Rivers, Wis.

PLEASE FORWARD YOUR NEW CATALOG NO. 10. MA-8-36

NAME.....
TITLE.....
FIRM NAME.....
ADDRESS.....
CITY..... STATE.....

SIMPLEX



Machining Two Cycle Motor Pistons

The flexibility of tooling to which Simplex Precision Boring Machines can be adapted is shown by this machining job on aluminum die-cast pistons for two cycle outboard motors.

The pistons are first centered, then set over driver on spindle and supported by ball bearing, spring loaded drive centers as shown. They are turned at spindle speed of 2500 rpm and feed of 7" min. with cam control to give both straight and taper sections. When the turning cut is finished, grooving tools come down and put the grooves in. Two spindles and two complete sets of tools operating simultaneously produce 106 pistons per hour.

STOKERUNIT CORPORATION
5325 WEST ROGERS ST. MILWAUKEE, WIS.

ILLINOIS DIE FILING MACHINE



A compact, reliable, smoothly operating machine for filing, sawing, or stoning.

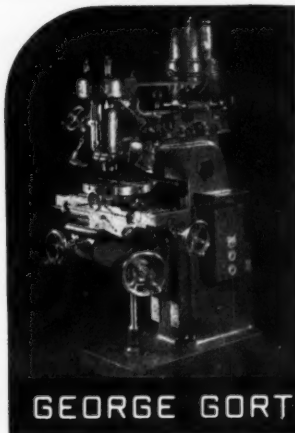
Base 14" x 18". Table 12" diameter, 12" high. Overall height of machine 25". Spindle stroke 1 1/2".

Regularly furnished with 1/4 H.P. A.C. motor, V belt drive, 2 speeds.

Descriptive circular and prices upon request.

ILLINOIS TOOL WORKS
2501 N. KEELER AVE., CHICAGO, ILL.
Manufacturers of Milling Cutters, Hobs and Special Tools.

GORTON Super-Speed VERTICAL MILLS

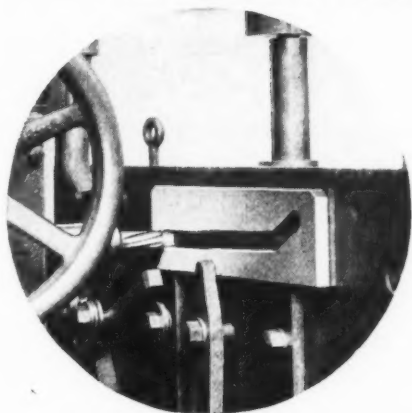


A New Series of High Spindle Speed Machines for Tool, Die, Mold and Production work, in three sizes for mills from 1/2" to 1 1/2" dia., — speeds to 6300 r.p.m. Send for new catalog.

1109 13th St., Racine, Wis.

GEORGE GORTON MACHINE CO.

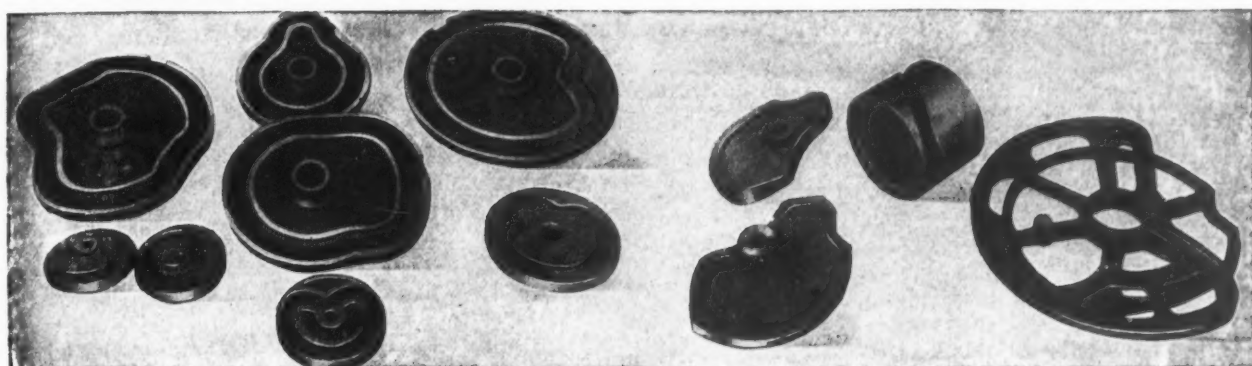
—Rowbottom for Cams—



Because You Save

Expert service, specialized (Rowbottom designed) equipment, efficient management enable us to provide a really economical cam production service for all types and sizes of cams. Do not let cam design cause trouble in new or old machines—consult Rowbottom—and save.

THE ROWBOTTOM MACHINE CO.
WATERBURY, CONN., U. S. A.



DAVIS KEYSEATERS

Two minutes to set up a new job!

Then the fast Davis Broaching Pull Cut with the multi-tooth cutter to quickly, accurately complete it. Davis Keyseating is fast and profitable both on jobbing and production work.

Tilting Table Model easily set to cut straight or tapered keyways in bores tapering to 3" per foot. Also made in Standard Fixed Table Model. Send for details.

DAVIS KEYSEATER CO.
405 Exchange St., ROCHESTER, N. Y.



AIR CONTROL—FOOT OPERATED

Guaranteed Leak-Proof—No Metal-to-metal Wear

Millions of Operations Without Repairs

Q. A. W. eliminates shut-downs and delays due to repairs or leakage. Foot valve shown for single or double acting cylinders. With or without neutral position or automatic returns. 2-way, 3-way, 4-way; 3/8" to 1 1/2" sizes.

Q. A. W. valves out-perform any other type of control valve.



Ask for Catalog "M"

Quick-As-Wink

FOR AIR CONTROL VALVES FOR WATER

C. B. HUNT & SON - SALEM, OHIO
DISTRIBUTORS IN PRINCIPAL CITIES

Representative in England: Gaston E. Warbaix, Ltd., London.



GRINDING
POLISHING
SANDING
DRILLING
REAMING

Strand

NUT SETTING
SCREW DRIVING
ROTARY FILING
STAINLESS STEEL
WELD FINISHING

Flexible Shafts and Machines

VERTICAL AND HORIZONTAL TYPES

1/2 TO 2 H.P.

Send for General Catalog

N. A. STRAND & CO. 5001 No. Lincoln St. CHICAGO, ILLINOIS

LUCAS "PRECISION"

Horizontal Boring, Drilling and Milling Machine

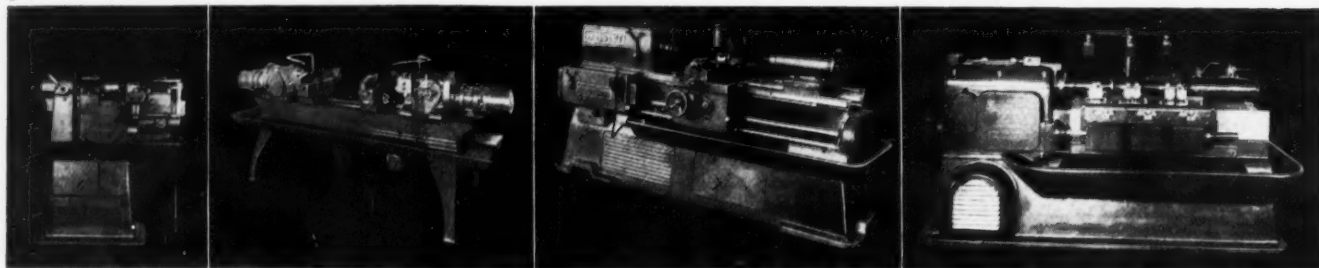
THE LUCAS MACHINE TOOL CO.

CLEVELAND, OHIO, U. S. A.

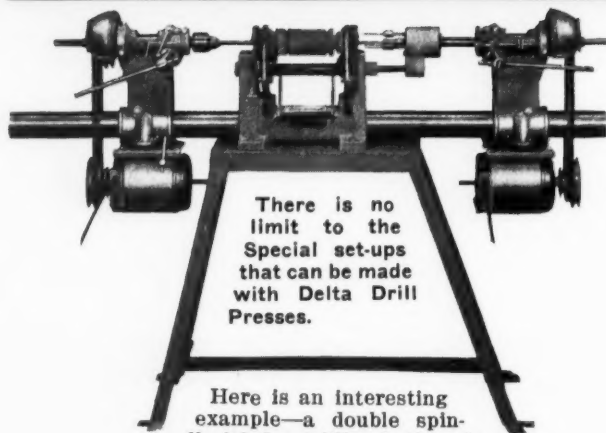
NOW AND ALWAYS OF

REDUCE YOUR TURNING COSTS WITH A *Lo-swing* LATHE

Write SENECA FALLS MACHINE CO., SENECA FALLS, N. Y., for details of these new machines.



UNUSUAL SET-UP WITH "DELTA" LOW COST DRILL PRESSES



There is no limit to the Special set-ups that can be made with Delta Drill Presses.

Here is an interesting example—a double spindle job for drilling both ends of the work at one time, with a special work-holding fixture and a Multiple Drill Head. Despite their astounding low cost, Delta Drill Presses possess accuracy, ruggedness, and flexibility that have won a place for them in thousands of industrial plants all over the world. Write for name of nearest dealer and for full details as to the possibilities for using Delta Tools to cut production costs.

DELTA MFG. CO.

634 E. Vienna Ave.,

MILWAUKEE, WIS.



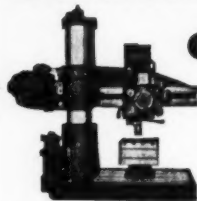
Drilling and Tapping Machines
(Automatic and Semi-Automatic)
LELAND GIFFORD CO.
WORCESTER, MASS.

"HOLE HOG"

Multiple Spindle Drillers, Borers, Counterborers, Reamers, Lappers, Tappers, and Universal Joint Machines

Particularly Designed for High Production Work
MOLINE TOOL CO., Moline, Ill.

Carltons are Reinforced at Points of Stress



Can be furnished in Column Diameters of 9", 11", 13", 15", 17", 19", 22" and 26", with arm lengths of 3', 4', 5', 6', 7', 8', 9', 10', 11', and 12'; with almost any style table, electric or compressed air column binder, power traverse of head on arm and any style motor drive.

—scientifically reinforced! The result is—years of profitable production and freedom from costly and unnecessary repairs. This extra strength, plus vibrationless and chatterless operation, even at higher-than-usual speeds, plus unexpected rigidity, make Carltons much more quiet and accurate! Enclosed gears, running in oil—ball bearings throughout—low hung drive to spindle—these features also contribute to the successful operation of Carlton Radials. For smooth production, always specify CARLTONS! Catalog on request.

THE CARLTON MACHINE TOOL CO., Cincinnati, O.

AUTOMATIC DRILLING AND TAPPING MACHINES KINGSBURY MACHINE TOOL CORP.

KEENE, NEW HAMPSHIRE

Originators of the Automatic Drilling Head Unit



MULTIPLE DRILLING AND TAPPING HEADS

Let us tell you how the Buhr "Flexible Manufacturing" plan can drastically lower your special drilling and tapping equipment costs. Catalogs, suggestions or estimates submitted without obligation.

BUHR MACHINE TOOL COMPANY
ANN ARBOR, MICH.

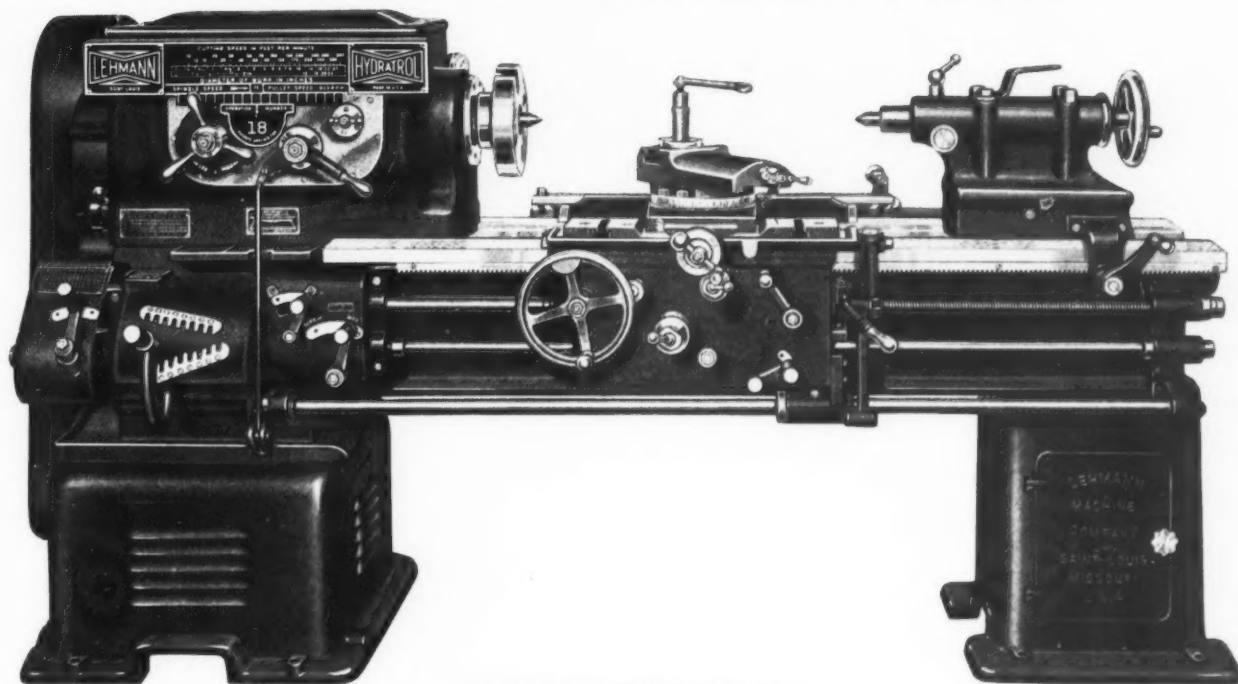


WALKER MAGNETIC CHUCKS

"The best way to hold most work, the only way to hold some of it"—completely efficient work holding equipment for all work from the small thin hard to hold jobs to the largest and heaviest parts. Send for illustrated catalog.

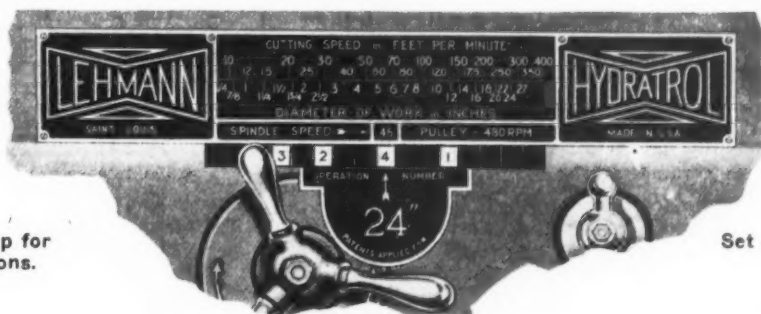
O. S. WALKER CO., INC., Worcester, Mass.

ONE YEAR OLD TO THE PUBLIC
THE HYDRATROL LATHE
 IS SEVERAL YEARS OLD IN APPROVED PERFORMANCE



FIRST IN THE FIELD

When the HYDRATROL lathe was introduced to the trade over a year ago it was a perfected machine and had proven its merits by exceptional performance under severe conditions of usage. It was the first public presentation of a lathe with hydraulically operated automatic speed changes for the spindle. Its features had been developed to a high degree of perfection in operation and for practical values to the user.



Showing set-up for four operations.

Set operation number to arrow point.

Improvements such as OPERATION NUMBER INDEX have been added.

Important Characteristics of the HYDRATROL Are—

- SPEED, SIMPLICITY AND SAFETY IN OPERATION.
- LEGIBLE PRESENTATION OF ESSENTIAL INFORMATION.
- SMOOTH RUNNING QUALITIES.
- TREMENDOUS POWER CAPACITY.
- NO REQUIREMENTS FOR ADJUSTMENTS.
- ALL REASONABLE PROOF THAT THESE QUALITIES WILL ENDURE.
- BUILT TO THE HIGHEST STANDARDS OF QUALITY.

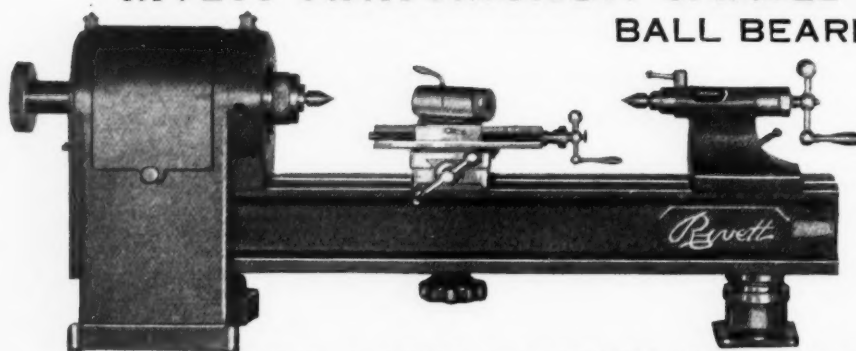
It Stops Running Before Lubrication Ceases and Until the Oil Supply Is Replenished

LEHMANN MACHINE CO.

3554 Chouteau Ave. — St. Louis, Mo., U.S.A.

RIVETT ANTI-FRICTION SPINDLE BENCH LATHES

BALL BEARING—ROLLER BEARING



The earning power of an anti-friction bearing lathe with Speed Box Drive may well be twice, or three times that of an old type counter- or jackshaft driven job.

Spindle is trouble-proof under all conditions.

Speeds are:—Ball Bearing, Maximum 4600 R.P.M.

Roller Bearing, Maximum 2300 R.P.M.

Endless belt is replaceable in one minute.

Motor runs continuously.

Speed Box gearing and multi steel disc clutch are splash lubricated.

Brake is automatic and stops spindle instantly.

Lever Chuck Closer has hardened steel rollers to

withstand severe continuous duty.

Double production. No lost time.

Bulletins 505-BB and 505-RB.

RIVETT LATHE & GRINDER INC., Brighton, Boston, Mass.

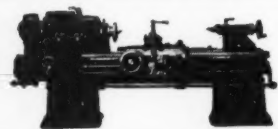


FOR OVER
A QUARTER OF
A CENTURY



THE PIONEER
MANUFACTURER OF
AUTOMATIC CHUCKING
EQUIPMENT

POTTER & JOHNSTON MACHINE CO.
PAWTUCKET, R. I., U. S. A.



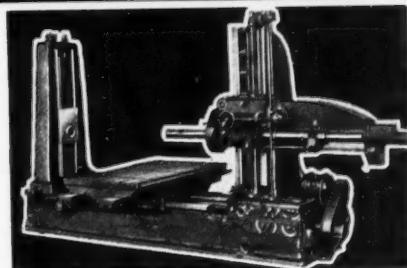
BOYE &
EMMES
LATHES

Forty years of specialized manufacture are behind this line of heavy duty lathes. They are made in a full range of sizes—from 14" to 36"—each of outstanding power, accuracy, range and economy.

Look in the finest shops for proof of Boye & Emmes performance. Their acceptance for every type of turning work is your assurance of fine performance and long life. Catalog on request.

THE BOYE & EMMES MACHINE TOOL CO.
CINCINNATI, OHIO, U. S. A.

UNIVERSAL HORIZONTAL BORING MACHINES



UNIVERSAL BORING MACHINE COMPANY
HUDSON, MASS., U. S. A.

SPRINGFIELD GEARED HEAD ENGINE LATHES

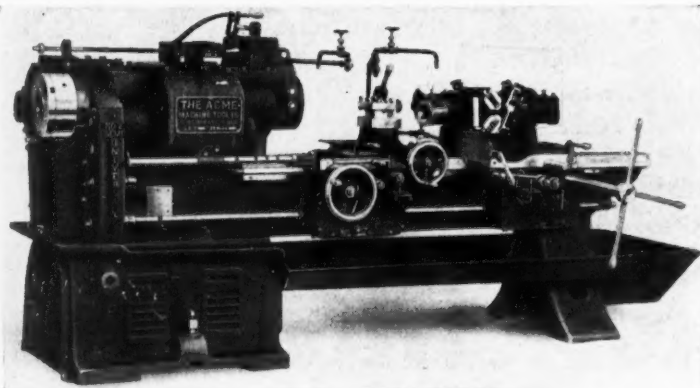
The Springfield Machine Tool Co., Springfield, Ohio



Porter-Cable
Machine Co.
Syracuse,
N. Y.

Compact power—
speed—strength

For rapid manufacture of
duplicate parts



CINCINNATI ACME Universal Turret Lathes

Designed and built for high production

A FEW FEATURES:

Hardened steel one piece vees.

Alloy steel sliding gears in head.

Gravity lock shift.

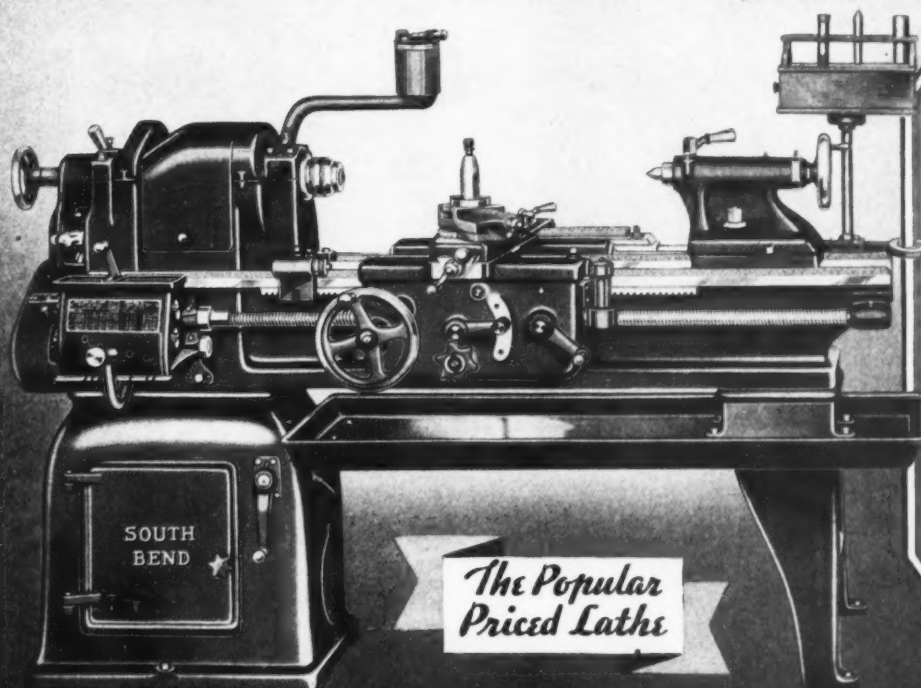
Multiple splined shafts.

Triple roller bearing spindle.

No Gears rotate on spindle.

All revolving parts in headstock on anti-friction bearings.

THE ACME MACHINE TOOL CO.
Cincinnati, Ohio



*The Popular
Priced Lathes*

*The NEW 1936
30TH ANNIVERSARY
MODEL*

For the Tool Room
In Countershaft Drive
and Motor Drive types.
9"-11"-13" and 16" swing.

*Write for new catalog
and prices.*

**SOUTH BEND
LATHE WORKS**

726 E. Madison St.,
South Bend, Ind., U. S. A.

Lathe shown is No. 1892-C;
16" swing by 6' bed.

SOUTH BEND *Precision* LATHES

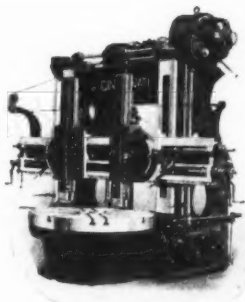
CONE 4-SPINDLE AUTOMATICS

are economical and accurate producers of screw machine parts up to 6" diameter, 7" milling length. They cut costs, increase production, boost profits. Write for particulars.

CONE AUTOMATIC MACHINE CO., Inc., Windsor, Vermont

REPRESENTATIVES:

Detroit: J. C. Austerberry's Sons,
684 E. Congress St.
Chicago: John H. Glover, 2127 N.
Sayre Ave.
Ohio: S. B. Martin, 1077 Erie Cliff
Drive, Lakewood, Ohio.
Indiana: G. A. Richey, Chamber of
Commerce Bldg., Indianapolis.
Pennsylvania: Arch Machinery Co.,
1029 Park Bldg., Pittsburgh, Pa.
New York State: Syracuse Supply
Co., Syracuse, N. Y., Rochester,
N. Y.
Philadelphia, Pa.: Lloyd & Arms,
Inc., 133 South 36th St.
New England: Potter & Johnston
Machine Co., Pawtucket, R. I.
California: C. F. Bulotti Machinery
Co., 829-31 Folsom St., San
Francisco, Calif.



**VERTICAL
BORING MILLS
PLANERS
DOUBLE HOUSING
OPENSIDE
CRANK PLANERS
PLANER
TYPE MILLERS**

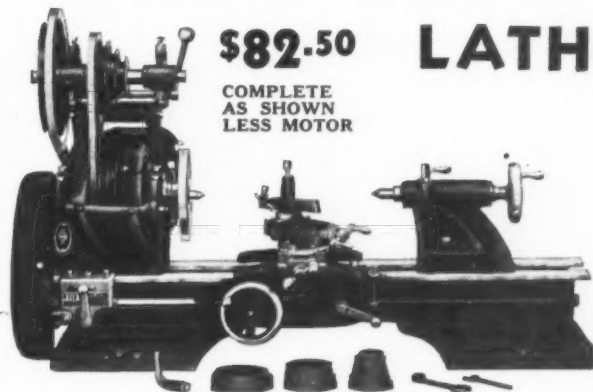
**THE CINCINNATI PLANER CO.
CINCINNATI, OHIO**

The New

ATLAS BACK-GEARED SCREW-CUTTING LATHE

\$82.50

COMPLETE
AS SHOWN
LESS MOTOR



**FOR THE MACHINE SHOP, LABORATORY,
MAINTENANCE DEPT. AND PRODUCTION**

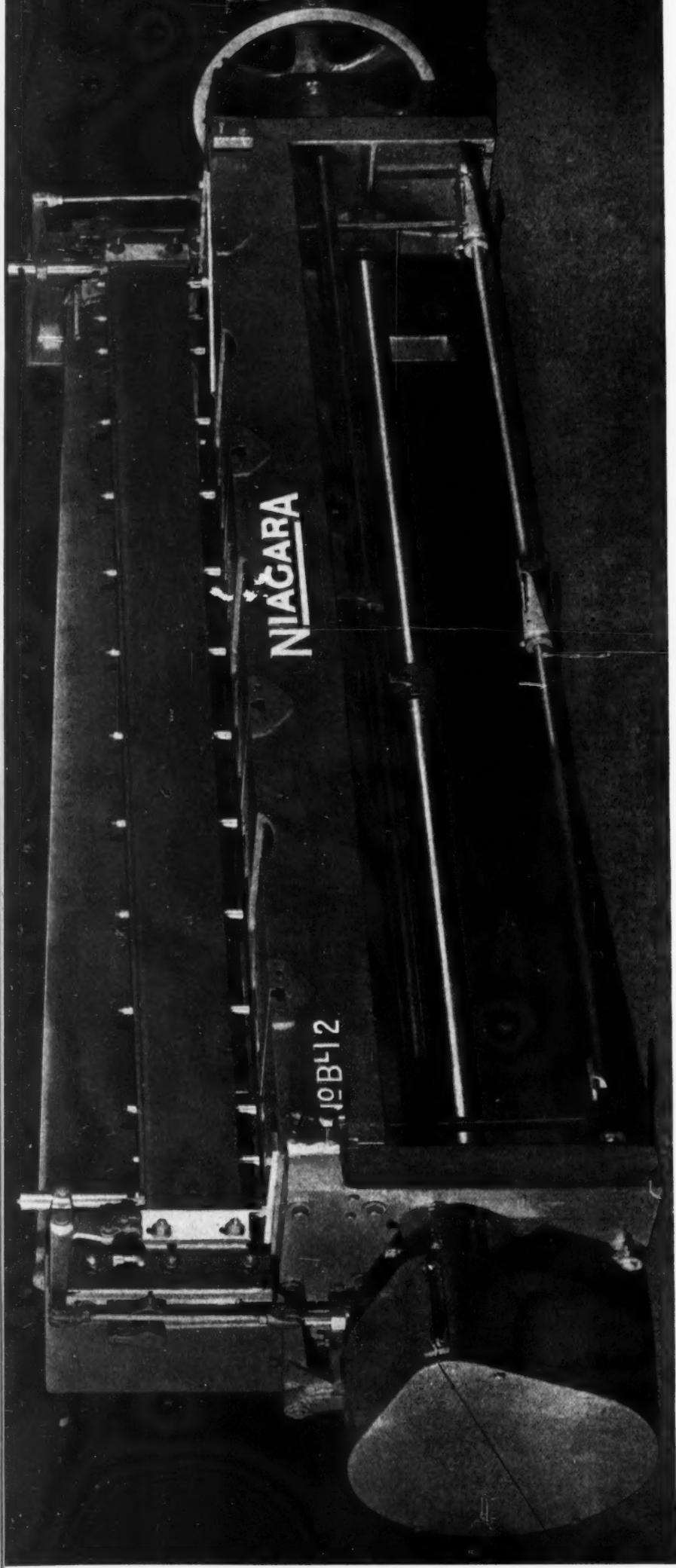
HAS: automatically reversible power feeds. Built in counter shaft and motor bracket. 10" swing. Takes 18" between centers. Attachments available for all lathe operations. Accuracy guaranteed to within .001".

Write TODAY for complete catalog of lathes, arbor presses, drill presses, tools and attachments.

Before buying a small lathe, it will pay you to investigate the NEW ATLAS.

ATLAS PRESS CO., 853 No. Pitcher St. Kalamazoo, Mich.

Chicago 35 E. Wacker Drive New York 130 W. 42nd St. Philadelphia 113 N. 3rd St.



Announcing the New Series "BL" Power Squaring Shears

10-12 Gage Capacity . . . 60 Strokes per Minute . . . 8, 10, 12 Foot Lengths

Low Crosshead Slope for flat shearing on production strip cutting.

Triangular section steel crosshead with truss rod,—resists torsion stresses in all directions.

Rearward sloping crosshead permits clear visibility of cutting line.

Unobstructed at rear for easy handling of sheared pieces.

Low operating height for convenient, safe operation.

Patented toggle-operated holddown with individual pressure feet.

Underdrive design with crosshead operated by connecting rods under tension,—no tension stresses on housings.

Bed keyed and bolted to housings.

WRITE FOR BULLETIN 71-F.

NIAGARA

NIAGARA MACHINE AND TOOL WORKS, BUFFALO, N. Y.

HYDRAULIC MACHINERY
ELMES
CHICAGO

1936 FORGING PRESS LINE

7-15

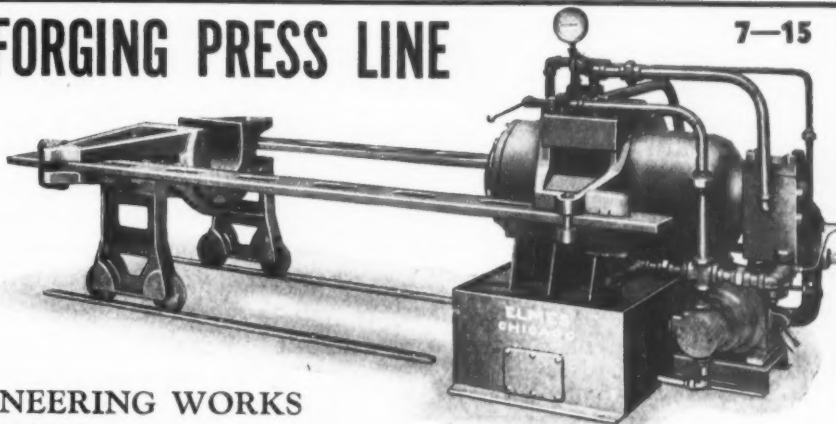
includes

NEW MODELS

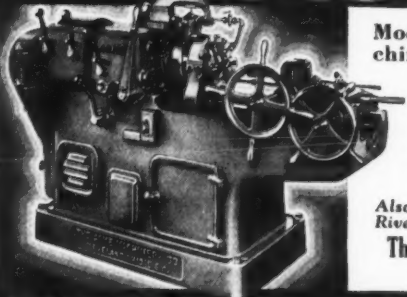
with High- and Low-pressure Rotary Pumping Units..Double Acting Cylinders;- Rapid Advance and Return;- Adjustable clearance between bars;- Opening between Ram and Resistance Head to suit.

CHARLES F. ELMES ENGINEERING WORKS

222 N. Morgan St., CHICAGO, ILL., U. S. A.



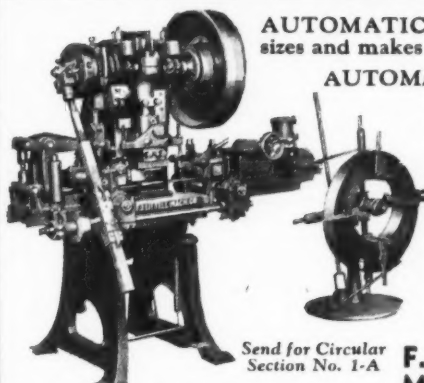
MODEL 35 ACME



Modern Threading Machines adapted to high production work. Can be equipped with either tangent or hobbled die heads. Write for bulletin.

Also builders of Acme Bolt-Rivet and Forging Machines.
The Acme Machinery Co.
CLEVELAND, O.

THREADING MACHINES



AUTOMATIC FEEDS for all sizes and makes of punch presses.

AUTOMATIC CENTERING REELS for the unreeling of coiled stock.

PUNCH PRESS AIR VALVES and **UNIVERSAL AIR NOZZLES** for the safe and quick ejection of work pieces.

Send for Circular Section No. 1-A

Punch Press Equipped with a Littell No. 3 Rack and Pinion Roll Feed, Straightener, Oiler, Scrap Cutter, and No. 3 Reel.

F. J. LITTELL MACHINE CO.
4127 Ravenswood Ave.
CHICAGO



WIRE FORMING MACHINES,
FOOT AND POWER PRESSES.
TUMBLING EQUIPMENT.
MULTIPLE SPINDLE LATHES—
For Chucked and Centered Work.

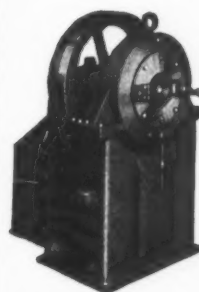
THE BAIRD MACHINE COMPANY
BRIDGEPORT, CONN.

GOSS and DE LEEUW

MULTIPLE SPINDLE

CHUCKING MACHINES

Two, Four, Five Spindles • Work and Tool Rotating Types
GOSS & DE LEEUW MACHINE CO., NEW BRITAIN, CONN.



Swaging—*What*
it is and *How*
it is done on

TORRINGTON SWAGING MACHINES

All explained in booklet—"The Torrington Swaging Machine"—Your copy mailed on request.

Examples of many possible operations by swaging method:—

- | | |
|---------------------------|---------------------------------|
| 1 Point rods for drawing | 8 Tap blanks |
| 2 Pointed rods and tubing | 9 Ice pick points |
| 3 Tapered rods and tubing | 10 Meat hooks |
| 4 Acetylene torch tubes | 11 Refrigerator expansion bulbs |
| 5 Curling iron tubes | 12 Sizing and Reducing wire |
| 6 Nail Sets—Prick Punches | |
| 7 Steel furniture legs | |

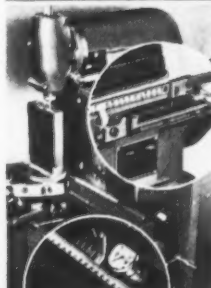
Present Owners of Torrington Swaging Machines are quoted promptly on request for prices for die renewals, etc.

THE TORRINGTON CO.

55 Field Street

Torrington, Conn.

UNIVERSAL



DECKEL SUPER UNIVERSALITY

Vertical, Horizontal, Angular Milling—Boring—Counter Boring—Facing—Slotting—Drilling—High Speed Profiling all in one setup.

PANTOGRAPHIC MACHINES

3 and 2 Dimensional Die Sinking
Mold Cutting Profiling—Engraving.

PREIS ENGRAVING MACHINE COMPANY
NEWARK, N. J.

MILLING MACHINE **F P 1**

Grant
Rotary
Vibratory
Riveter



GRANT RIVETED A BETTER JOB

Clean, well set, well finished rivets that improve the appearance of the work, a sturdy assembly job that will stand up. "Tight rivets that will not work loose, loose rivets that do not bind"—the kind of rivets you want in large or small work. Grant Riveters in two models, several sizes. Send samples for riveting—get details, prices.

Grant
Noiseless
Rivet
Spinner



THE GRANT MFG. & MACHINE CO.

N.W. STATION, BRIDGEPORT, CONN.

WALTHAM TRADE MARK REGISTERED U.S. PAT. OFF.

—the choice of the Industry for small, delicate or irregular punchings, requiring two or more operations! A versatile press, with unusual clearance in front and rear. Therein lies the secret of its accuracy; maximum space and light are available for locating parts in second or third operations . . . with speed as the by-product. The Overhang Type Sub-Press is illustrated. Blanking operations with or without roll feed are best accomplished on the Waltham Arch Type. Both types are designed to go easy on dies. Write for descriptive booklet.

The OVERHANG TYPE is illustrated here. The Arch Type is for blanking, with or without roll feed. Circulars on request.



WALTHAM MACHINE WORKS

NEWTON STREET, WALTHAM, MASS.

Makers of Small Thread Millers, Gear Cutters and other Small Automatic Machines

PRODUCTION INCREASED



because safety is insured for operator working in normal position.

D & M AUTOMATIC PUNCH PRESS GUARD

Simple — Fool-proof — Easily Installed

No interference with natural working movements.

Sizes for all presses. Give name, size, type, stroke of press—whether left to right or right to left swing is desired. Price \$18.50 to \$28.00. Try a D & M for 30 days without cost.

TAYLOR - SHANTZ, INC.
2 Commercial St. ROCHESTER, N. Y.

BETTER-MADE
DIE SETS

AT LOWER
COST

24
DIFFERENT
STYLES

OVER
95,000
SIZES

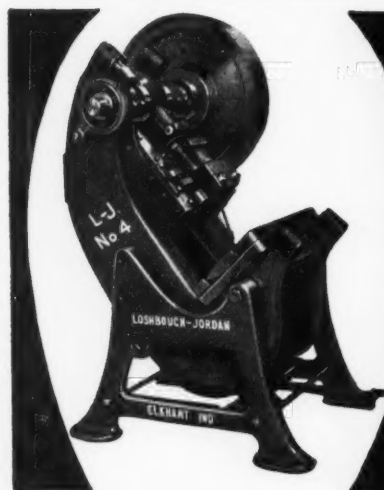


Semi-Steel

Drop Forged Steel

Send for Our New 208-Page Catalog

E. A. BAUMBACH MFG. CO.
1810 South Kilbourn Ave. Chicago, Ill.



INCLINABLE POWER PRESSES

Standard Since 1911

LOSHBOUGH-JORDAN
TOOL & MACHINE CO.
ELKHART, INDIANA

FIFTY YEARS' EXPERIENCE

Hot and Cold Swaging Machines . . Hammering Machines . . Sensitive Drills . . Multiple Spindle Drilling and Tapping Machines . . Multiple Spindle Attachable Drill Heads . . Automatic Drilling and Tapping Units . . Special Machinery.

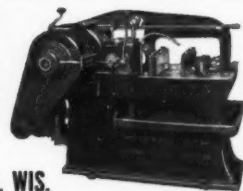
ALSO REBUILT TOOLS OF OUR OWN MAKE

LANGELIER MFG. CO., PROVIDENCE, R. I.

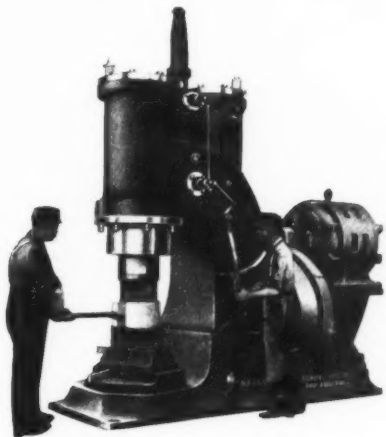
RACINE METAL CUTTING MACHINES

"Standard the World over"

RACINE TOOL AND MACHINE CO • RACINE, WIS.



SELF CONTAINED



Motor Driven--Air Operated

You can't make a mistake by using a Hammer which has been tested and time-tried by nearly 1,100 Firms in 67 different Industries.

Many reasons make the Nazel Hammer "preferred". Chief among these are (1) A self-contained Unit (Hammer, Motor and Compressor all "one"). (2) Consumes power only when running. (3) Gives a

powerful, squeezing blow. (4) Positive in action. (5) Simply controlled. (6) Durable Construction. (7) Uses minimum power. (8) Gives high operating efficiency.

Unequalled for Mass Production—Commercial Forging—or Plant Maintenance Work.

Send for Literature and Users' Opinions.



Nazel Engineering & Machine Works

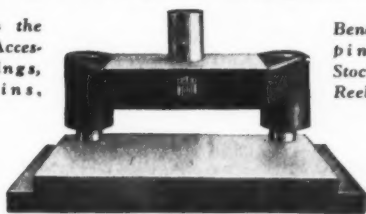
4047 N. 5th Street, Phila., Pa.

"Also makers of the famous Dill Slotter"

DIE SETS AND ACCESSORIES

COMPARE! Users say there is a difference between U.S. Tool Die Sets and others. Send for Catalog which gives facts, prices.

Also covers the U. S. Tool Accessories: Springs, Dowel Pins,



Bench and Lap-
ping Plates,
Stock Feeds and
Reels, etc.

U.S. TOOL COMPANY, INC., AMPERE, N. J.

Alfred Herbert Ltd.

Coventry, England

The best organization in the Old World for the sale of high class machine tools and equipment.

Representatives are practical shop-trained engineer salesmen who know what they are talking about.

Offices and showrooms at:—London, Coventry, Paris, Brussels, Milan, Calcutta, Bombay, Sydney, Melbourne, Osaka, Tokio, Johannesburg and Buenos Aires.

Immediate attention to correspondence.

17 STYLES AND SIZES

MERRELL

PIPE THREADING for BETTER threads MACHINES

TOLEDO, OHIO

As a Blatter Absorbs

Ink

FELT

engineered
to the job by
FELTERS
ABSORBS
NOISE
and
VIBRATION

Put your production machinery on FELT. Put your office appliances on FELT. Put your product on FELT; and put FELT into your product! Use FELT—engineered to the job by *Felters*—wherever sound is to be silenced; lubricants to be retained; dirt excluded; vibration cushioned; surfaces protected.

Mail the coupon for two interesting books on FELT; no charge or obligation.

THE FELTERS CO., INC.

210 South St., Dept. M, Boston, Mass.

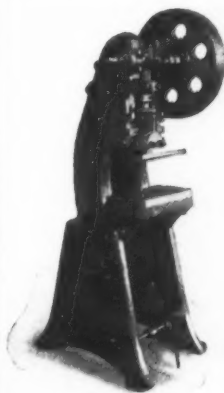
Manufacturers of Felt and Felt Products

MILLS AT MILLBURY, MASS., JOHNSON CITY, N. Y., AND JACKSON, MICH.

BRANCHES AT NEW YORK, PHILADELPHIA, CLEVELAND
DETROIT, ST. LOUIS, CHICAGO, LOS ANGELES
SAN FRANCISCO, DALLAS

Please send me the books checked below:
"Felt Uses"..... "A Study of Vibration in Plant Machinery".....
Both Books.

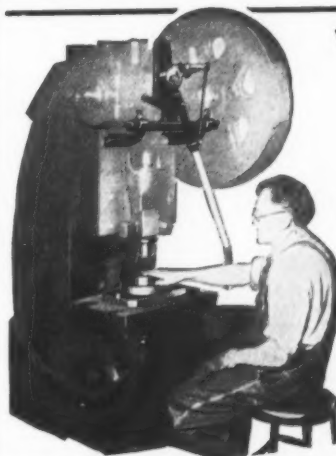
Your name.....
Firm.....
Address..... MB



Thirty-One Years
of
Service and Quality
has been our record

We Build
POWER PRESSES
of all styles and sizes
Patent Percussion Presses
Our Specialty

ZEH & HAHNEMANN CO.
182 Vanderpool St., Newark, N. J.



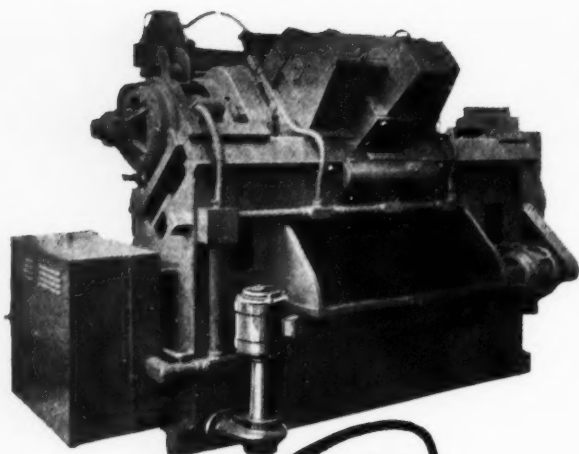
Wiesman Safety Press Guard

Safety—real accident protection on any make or type of power press—a simple, inexpensive guard that does not interfere with the natural working movements of the operator or interfere with production capacity of machine.

Made for right or left hand stroke. Users of presses find "Wiesman Safety" Pays. Send for details.

Wiesman Mfg. Co.

31 to 35 South St. Clair St.
DAYTON, OHIO, U.S.A.



THIS IS IT!

Ruthman Gusher Coolant Pumps have had the reputation for giving satisfaction for years—as evidenced in their acceptance by the most well known machine tool manufacturers.

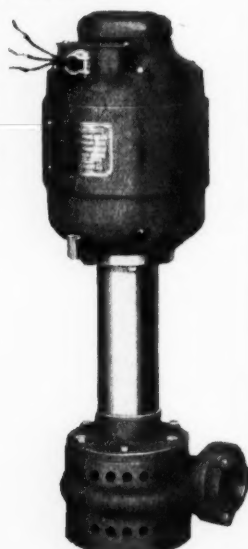
Nevertheless, a constant search for improvements is maintained so that today, when production speeds are universally increased, Ruthman Gusher Coolant Pumps meet with wider acceptance and would, if it were possible, give an even greater satisfaction as replacements or as original installations. An unconditional full year guarantee goes with every Ruthman Pump. Write for Data Sheets and dimension prints.

**THE RUTHMAN MACHINERY CO.
CINCINNATI, OHIO, U. S. A.**



Outside Mounted Type
Model 11022

LeBlond specifies the best. The above machine equipped with a Ruthman Pump, is a LeBlond Automatic Crank Shaft Machine.



Immersion Type
Model 11021

**GUSHER COOLANT
PUMP**

100—MACHINERY, August, 1936

SAVE!
on SPECIAL PUMPS

...by telling **your** requirements to **us**.
Often, from our extensive line, we can adapt **STOCK PARTS** for the user's benefit.

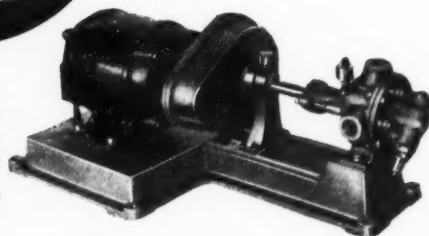
What are your pump needs?

Brown & Sharpe Mfg. Co.
Providence, R. I., U. S. A.

**BROWN & SHARPE
PUMPS**

2 MOVING PARTS
MEAN LOWER POWER REQUIREMENTS
LESS WEAR... LONGER LIFE!

At right: The Viking Small Geared Motor Drive Unit—Capacities of 5, 10, and 20 G.P.M. Popular in all types of plants because of its flexibility—its easy adaptability to many types of applications.



Viking Rotary Pumps are offered in three general types. The Standard Models for the economical and efficient handling of all grit-free liquids are available in capacities from 1/5 to 1,050 G.P.M.

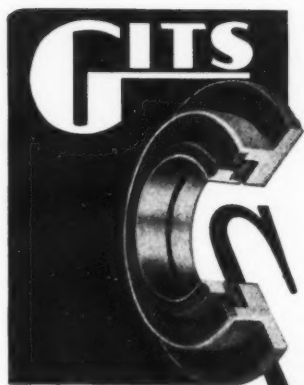
Viking Hydraulic Oil Pressure Pumps in capacities from 5 to 200 G.P.M. are especially designed for the actuation and the operation of hydraulic lifts and elevators and all other applications requiring a hydraulic pressure up to 500 pounds per square inch.

For all Coolant purposes Viking offers a wide range of coolant pumps in capacities of 5, 10, 15, 20 and 35 G.P.M.

All Viking Pumps regardless of type or capacity feature Viking's original "Gear Within A Gear—Two Moving Parts" Principle—famous for a quarter century—tested in over 500,000 units in successful operation today.

VIKING PUMP COMPANY, Cedar Falls, Iowa

VIKING Rotary PUMPS



HIGH Speed SEAL

Descriptive and dimensional data will be furnished upon request.

Oil is sealed in housing by bronze ring pressing against bearing race or shaft shoulder. Several small compression springs assure evenly distributed pressure.

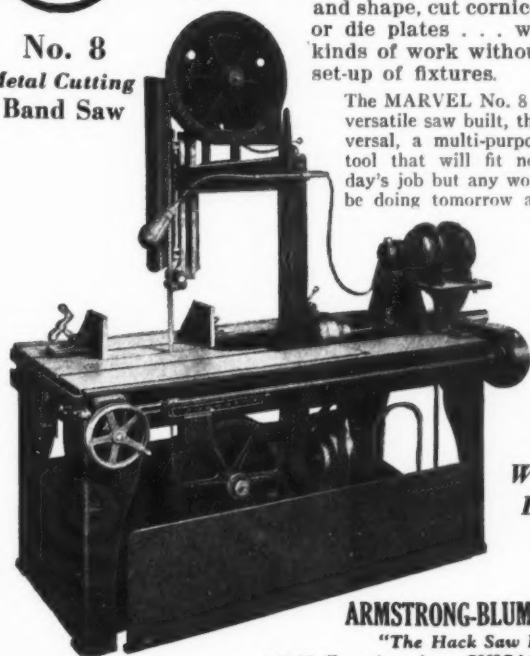
Gits high speed seals are furnished with fabric or metal diaphragms. Fabric diaphragm seals are to be used where temperatures are constant up to 220° F. The metal should be used on applications where constant temperatures are above 225° F.

GITS BROS
MANUFACTURING CO.
1858 S. KILBOURN AVE., CHICAGO

for Light Work and Heavy Work ... for Mitring, Coping and Notching



No. 8
Metal Cutting
Band Saw



fed by hand or by power, it's all the same to the MARVEL No. 8. It will "bite" off the end of an $\frac{1}{8}$ " rod or take a healthy slice from an 18"x18" billet with equal ease. It will cut perpendicularly or at 45° angles right or left . . . will do roughing to size and shape, cut cornices, beams or die plates . . . will do all kinds of work without special set-up of fixtures.

The MARVEL No. 8 is the most versatile saw built, the most universal, a multi-purpose machine tool that will fit not only today's job but any work you may be doing tomorrow as well.

*Write for
Bulletin
800*

ARMSTRONG-BLUM MFG. CO.
"The Hack Saw People"
343 N. Francisco Ave., CHICAGO, U. S. A.



**EASIER CONTROL
MAXIMUM POWER
SIMPLER OPERATION
SPEEDIER PRODUCTION
GREATER PRODUCTION**



*High Speed Radial
Drilling and Tapping
Machine by
Western Machine
Tool Works, Hol-
land, Mich.*

This exceptionally fast driller and tapper, 2000 rpm of spindle, is equipped with Multiple Disc, Close Coupled Model, Twin Disc Clutches. Entirely enclosed and running in oil, these clutches operate at a constant speed, transmitting maximum power at any spindle speed. Operated from in front of the head, by the Western ball handle lever control, the Twin Disc Clutches not only insure easier operation but speedier and greater production. Engaging either one of the clutches, located in the bevel gear, with this control gives forward or reverse direction to spindle. This is outstanding simplicity of operation.

Twin Disc Close Coupled Model Clutches may be had in both single and duplex construction in either oil or dry type. Write for specific recommendations. Engineering data on request. **Twin Disc Clutch Company, 1324 Racine St., Racine, Wis.**



*Close Coupled Duplex
Oil Type Clutch*

TWIN DISC
CLUTCHES

The first part of the paper is devoted to a discussion of the
 various methods which have been proposed for the determination of
 the rate of reaction between a solid and a liquid. The methods
 which have been proposed may be divided into two classes: (1) those
 which are based on the measurement of the change in the weight of the
 solid, and (2) those which are based on the measurement of the change in
 the concentration of the liquid. The first class of methods is the more
 accurate, but it is also the more tedious. The second class of methods
 is the less accurate, but it is also the less tedious.

The methods which are based on the measurement of the change in the
 weight of the solid are the more accurate, but they are also the more
 tedious. The methods which are based on the measurement of the change in
 the concentration of the liquid are the less accurate, but they are also
 the less tedious.

The methods which are based on the measurement of the change in the
 weight of the solid are the more accurate, but they are also the more
 tedious. The methods which are based on the measurement of the change in
 the concentration of the liquid are the less accurate, but they are also
 the less tedious.

MAKERS—USERS OF SMALL TOOLS AND ACCESSORIES

Be Sure to See

SEPTEMBER

Number of

MACHINERY

**LATEST NEWS AND DEVELOPMENTS IN
SMALL TOOL DESIGN, MATERIALS,
APPLICATION AND MAINTENANCE**

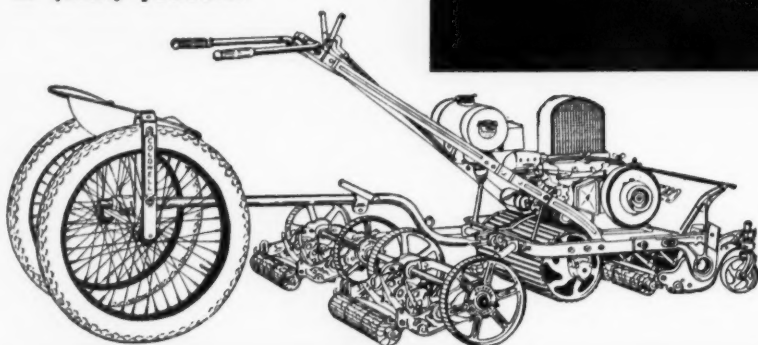
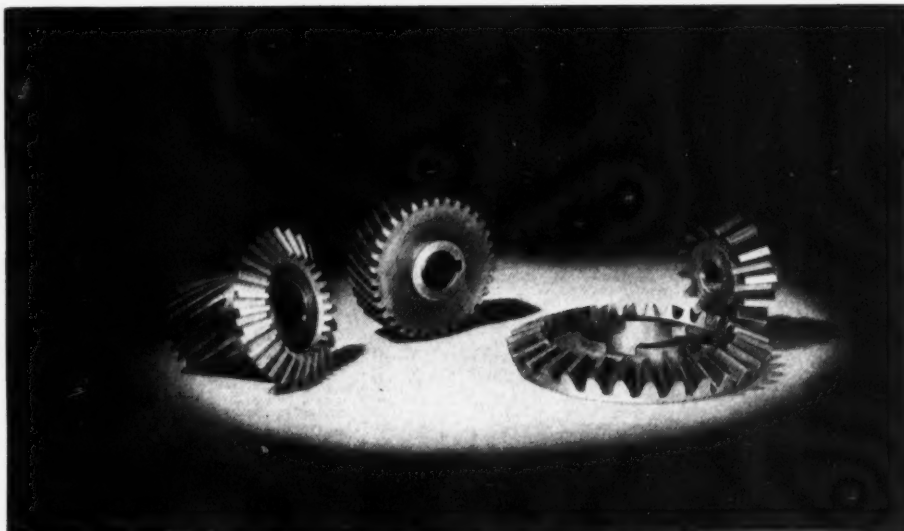


PERKINS Custom Cut GEARS

Power Mowers Take Good Gears

High grade steel, correct heat treatment, accurate machining—Perkins Gears are dependable transmission for sturdy, efficient power lawn mowers.

Perkins Custom Cut Gears "stand the gaff" in machine tools, portable tools, movie apparatus, electrical household and office equipment—in fact, wherever small gears are used in quality products.

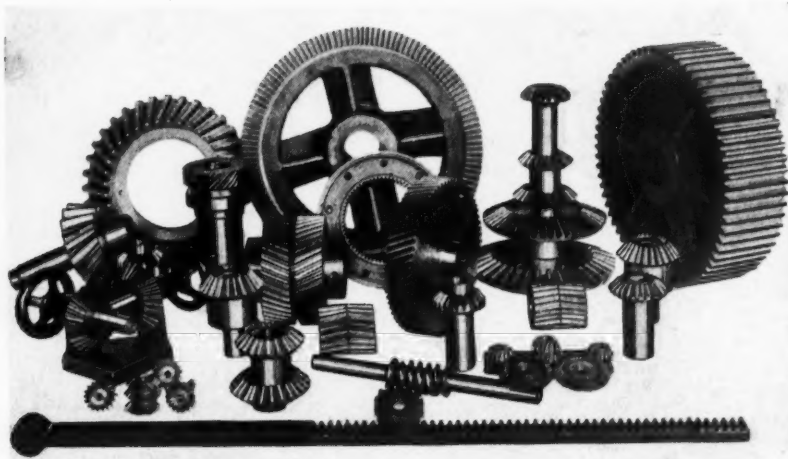


We manufacture gears—bevels, spirals, one piece combinations of bevels and spirals, spurs, helicals, worms, wheels, etc., to manufacturer's specifications for all types of equipment. Get Perkins estimates on your needs.

**PERKINS MACHINE
& GEAR COMPANY**
110 CIRCUIT AVENUE
SPRINGFIELD MASS.

BILGRAM GEARS

ELLIPTICALS,
HERRINGBONES,
HELICALS,
RACKS, BEVELS,
SPURS, HYPOIDS,
SPIRALS, WORMS



Correctly designed, accurately cut, smooth running gears wear longest and use least power to operate. Gears made by specialists with specially designed equipment are more economical.

Try . . .
BILGRAM GEARS
—let us estimate on
your needs.

BILGRAM GEAR & MACHINE WORKS

1217-1235 SPRING GARDEN STREET, PHILADELPHIA, PA.

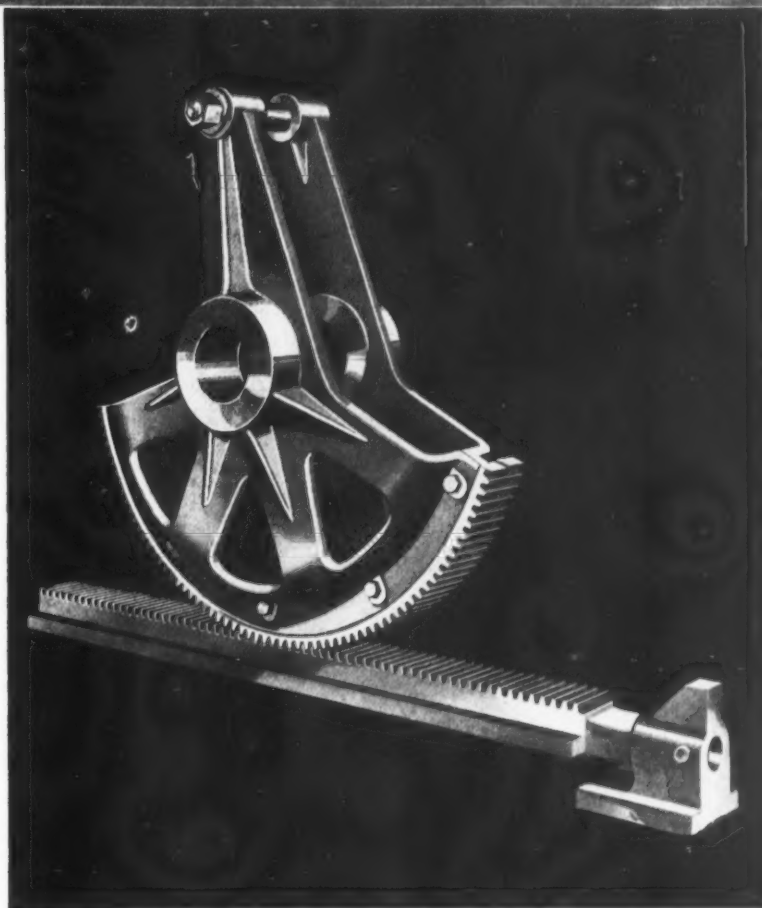
UNUSUAL

GEARS BY PHILADELPHIA

An analysis of "Phillie Gear" production reports shows that the majority of gears produced at the Works are UNUSUAL GEARS . . . gears requiring special ability in their design and manufacture. Naturally, there must be reasons why so great a volume of highly specialized gear engineering finds its way to the Philadelphia Gear Works. There are, of course. For example, a simple plant inspection will show . . .

- 1 An unusual power transmission staff, eminently successful in designing and working with designing engineers in the development of standard or special gearing for all kinds of industrial machinery.
- 2 Almost a half century of high quality, specialized gear making experience.
- 3 An unusual combination of all kinds of special and standard production equipment for generating any type of gearing.
- 4 An unusually intelligent, well trained, highly skilled staff of production men able to understand the problem at hand and, by splendid craftsmanship, to produce a finished product that will meet every requirement of both the designer and user.
- 5 An unusually well organized staff of expeditors whose sole duty is SERVICE . . . to deliver the job when requested.

Because of these reasons . . . in fact, because of ANY ONE of them . . . a multitude of unusual assignments are presented to "Phillie Gear" engineers every day. Frequently, these assignments come from the remotest parts of the globe . . . a tribute, indeed, to the precepts upon which the founders of this organization opened a modest shop almost 50 years ago.



The gear illustrated was made for specially designed hydraulically and mechanically actuated tilting mechanism carrying heavy loads. Hydraulically operated rack transmits reciprocating motion to sector. Tie bar, being fastened to pin in sector, thus produces tilting motion.

PHILADELPHIA GEAR WORKS

Main Office and Plant

2nd Avenue and G Street, Philadelphia, Pa.

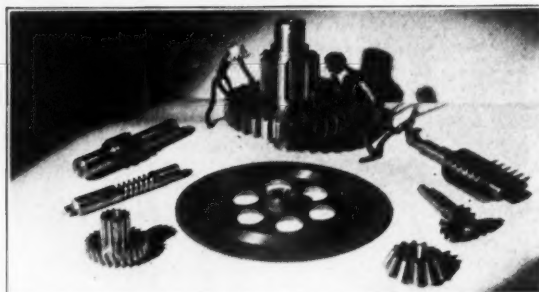
Industrial Gears and Speed Reducers

Branch Sales and Eng. Offices

San Francisco and New York

Each
doing
a good
job
for
somebody

SOME OF THESE AND THOSE



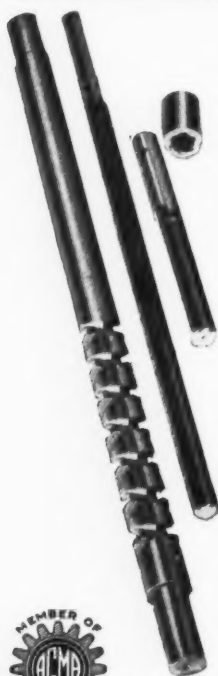
"THEY LIVE ON THE JOB"

The
somebodies
keep
coming
for more
Mass.  Gears

Massachusetts Gear & Tool Company

34 Nashua St.

Woburn, Mass.



Everything in GEARS & SCREWS

Call STAHL for your next job in gear manufacture. You will recognize the unmistakable evidences of specialized experience. Behind this experience is the finest and most complete equipment, including a very large stock of patterns. Thus you get not only tops in craftsmanship, but *quick service* that saves time and money for you!

EVERYTHING in gears—spurs, bevels, spirals, herringbones, worm gears, racks, feeds, and screws; rawhide, fabroil and bakelite pinions. Estimates or suggestions are offered without obligation.

THE STAHL GEAR & MACHINE CO.
1390 E. 40th St., Cleveland, Ohio



GEARS WORMS CAMS CONTRACT MACHINE WORK

Universal customer satisfaction guaranteed by Hartford experience, production equipment, product standards. Try Hartford—you can *guarantee* these parts in your products. Let us estimate on your needs.

THE HARTFORD SPECIAL MACHINERY CO.
293 Homestead Ave. HARTFORD, CONN.

EARLE

Cut Spur, Bevel, Herringbone and Worm Gears

All sizes. Every description. Operating Machinery for Bridges, etc. "Lea Simplex" Cold Metal Saws.

The
Earle Gear & Machine Co.
4709 Stenton Ave.
Philadelphia, Pa.
110 State St., Boston, Mass.
149 Broadway, New York City

GEARS

Ganschow

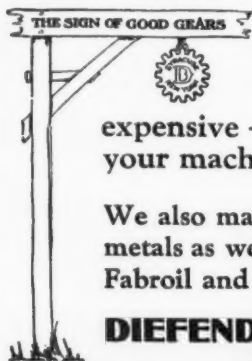
Spur—Speed Transformers—Worm

All Types of
Cut Gears

4-Speed Positive Drive Reducer
Silent Laminated Steel Pinions

GANSCHOW GEAR CO., 1015 W. Washington, Chicago

Diefendorf Spiral Bevel Gears



Spiral Bevel Gears run quietly and with great smoothness. They are not expensive—incorporate them into your machine. Let us quote.

We also make all other types of gears in all metals as well as Micarta, Celoron, Formica, Fabroil and Rawhide. Quick service.

DIEFENDORF GEAR CORPORATION
SYRACUSE, N. Y., U. S. A.





**CUTTING
THE COST OF
POWER
TRANSMISSION**

**"From stock" . TWO WORDS
WITH IMMENSE MONEY SAVING POSSIBILITIES**

"From Stock," as applied to Boston Power Transmission Equipment, means *far more* than simply buying "ready-made" Gears, Chain, or Speed Reducers from a warehouse. First, the cost of Power Transmission can be cut only by *correctly designed and manufactured* products — and, secondly, these products *must be readily available*, in the type and size you want. This two-fold service is offered by the Boston Gear Works . . . the result of 50 years experience, in the making of *modernized and standardized* power transmission equipment. "From Stock" as applied to Boston Gear Products means exactly the right part — at the right price — delivered in a few hours from 21 service warehouses from coast to coast.

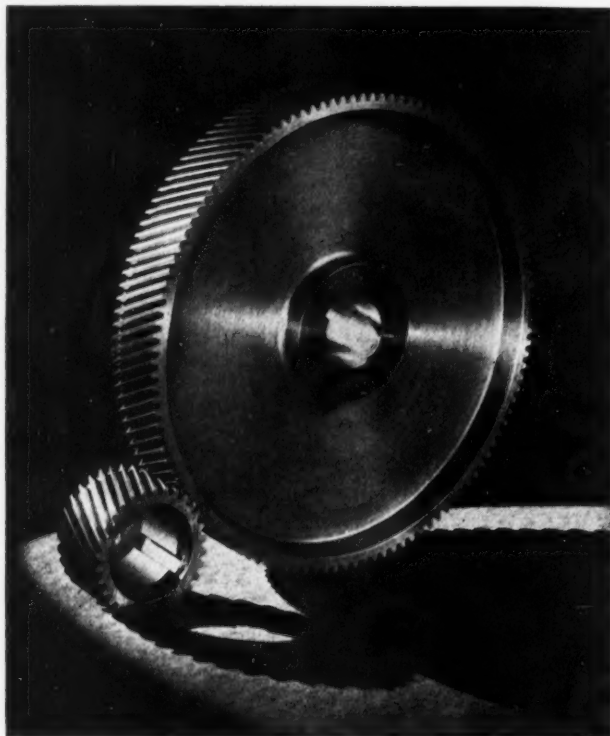
SEND TODAY FOR CATALOG M850

**BOSTON GEAR WORKS, INC.
NORTH QUINCY, MASS., U. S. A.**

Direct factory branches in Boston, New York, Philadelphia, Cleveland, and Chicago. Sales offices in Utica, N. Y., Rochester, N. Y., Dayton, Ohio, and Springfield, Mass.



BOSTON GEARS



Whatever your gear requirements, Grant gear makers are ready at all times to meet them promptly and exactly.

GRANT GEAR WORKS, Boston

"Smoother than Grease"
Since 1890



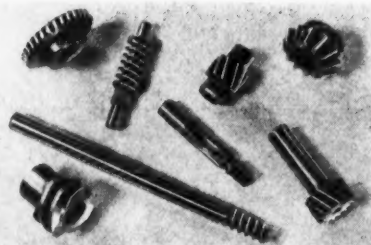
20 years without a drink—

ARGUTO OILLESS BEARING CO.

Wayne Junction, Philadelphia, Pa.

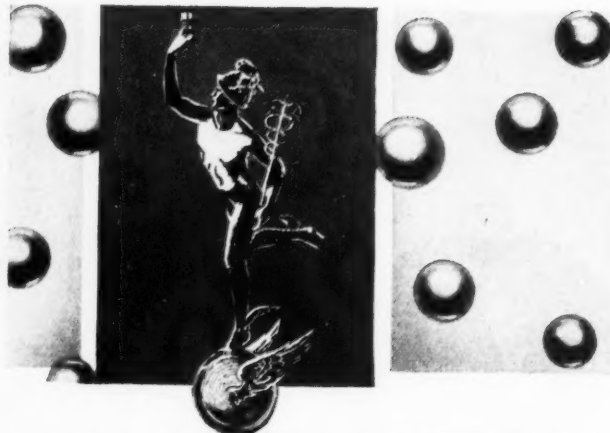
CROFOOT SUPERIOR GEARS AND WORMS

Small and medium sizes, highest quality gears and worms for mechanisms requiring dependable gearing. Modern production methods insure your complete satisfaction at the right price. LET CROFOOT ESTIMATE.



CHARLES E. CROFOOT GEAR CORP.

65 Central Street
South Easton, Mass.



HIGH CARBON CHROME ALLOY STEEL

WATERBURY STEEL BALLS have *uniform* hardness to the center of each ball. Surfaces are highly finished. Accuracy, precision, strength with no imperfections.

HIGH CARBON, CHROME ALLOY STEEL, BRONZE, MONEL METAL, STAINLESS STEEL BALLS, STANDARD OR SPECIAL SIZES. WRITE FOR COMPLETE INFORMATION.

WATERBURY STEEL BALLS

THE WATERBURY STEEL BALL CO., INC.

Poughkeepsie, New York

Factory: Waterbury, Conn.

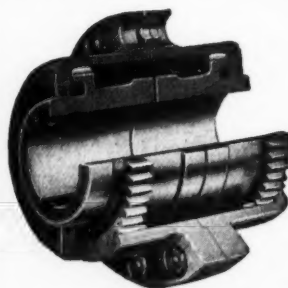
POOLE Flexible Couplings

MADE TO ENDURE

NO Springs
Rubber
Die Castings
Pins
Bushings

POOLE Couplings are of the best grade forged steel made to rigid specifications.

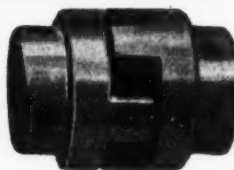
Send for Catalog M36.



POOLE FOUNDRY & MACHINE CO.

3701 Clipper Mill Rd.

Woodberry, Baltimore, Md.



L-R Type "I-A"
(Patented)

L-R Everlasting Type "I-A" FLEXIBLE COUPLINGS make the going smooth. Economical in first cost and maintenance.

Trouble-free. Take less space. Easy to install. No lubrication. $\frac{1}{4}$ " to 3" bores. Write for TEST SAMPLE.

LOVEJOY TOOL WORKS
5021 W. Lake St., Chicago, Ill.



CULLMAN SPROCKETS

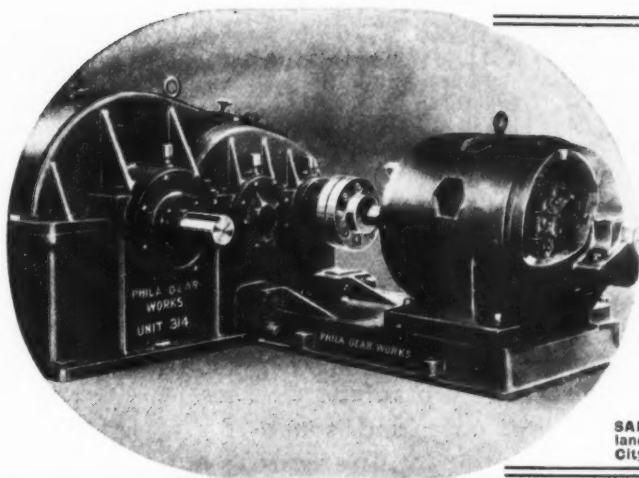
OVER 45,000 SPROCKETS
CARRIED IN STOCK

Send for Catalog

CULLMAN WHEEL COMPANY

1339 Altgeld St.

Chicago, Ill.



AJAX COUPLINGS

A Typical Motor Installation. The Ajax Flexible Coupling on this heavy duty Herringbone Speed Reducer absorbs all shocks of momentary overload, dampens vibration, requires no care.

Why Ajax? Because of quality materials, sound design, accurate machining; bumpers of resilient, long-lived rubber smooth out ordinary power impulses, greatly reduce heavy emergency overload and shocks.

The best insurance for motor and driven equipment is an Ajax Flexible Coupling. Send for details.

AJAX FLEXIBLE COUPLING CO.
12 English Street WESTFIELD, N. Y.

MAKERS OF FLEXIBLE COUPLINGS SINCE 1920

SALES OFFICES—Atlanta, Birmingham, Boston, Buffalo, Chicago, Cincinnati, Cleveland, Detroit, Fort Worth, Indianapolis, Los Angeles, Minneapolis, Montreal, New York City, Philadelphia, Pittsburgh, St. Louis, San Antonio, San Francisco, Syracuse.

NICE BALL BEARINGS

UNGROUND RADIAL BEARINGS

Single Row Radial Bearings, Single Row Flanged Radial Bearings, Stainless Steel Bearings, Double Row Radial Bearings.

UNGROUND COMBINATION BEARINGS

Pressed Steel Radial and Thrust Bearings, Turned Cone Radial and Thrust Bearings.

THRUST BEARINGS

Unground Banded Thrust Bearings, Ground Thrust Bearings, Heavy Duty Ground Thrust Bearings, Angular Contact Bearings.

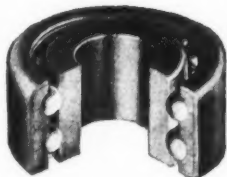
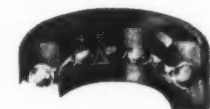
RETAINERS

Flat type, L - Diamond Interlocking, Diamond.

BALL BEARING WHEELS

Round, Square, Flat and Curved, Flanged Treads, Conveyor trolley wheels.

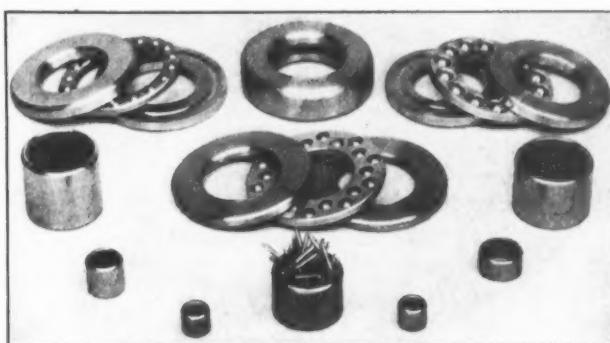
More than 33 years of experience in designing and manufacturing quality Bearings.



NICE BALL BEARING CO., NICETOWN, PHILADELPHIA, PA.



Write for NICE CATALOG... contains many photographs and drawings useful to engineers. An excellent reference book.



800% GREATER DEMAND

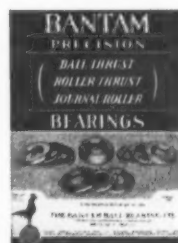
THAT'S the way industry has been flocking to Bantam for bearing requirements, whether they be Ball Thrust, Roller Thrust or Journal Rollers. An 800% increase in demand since 1932.

After all, "the proof of the pudding is in the eating," so why not try Bantam Bearings once? From then on your own good judgement will bring you back for more.

Write for NEW Catalog

Every designing engineer in the country should have a copy of this book. It shows a comprehensive picture of the bearings which are saving money for manufacturers of small and large machinery. Send for catalog No. 101 TODAY!

THE BANTAM BALL BEARING CO.
SOUTH BEND, INDIANA



TAKE YOUR TOUGHEST BEARING JOB TO BANTAM



UNIVERSAL STANDARD DRILL BUSHINGS
MADE TO A. S. A. SIZES
LOWEST COST - LONGEST LIFE
UNIVERSAL ENGINEERING CO.
FRANKENMUTH, MICHIGAN

Heavy Duty Thrust Bearings



Special Bearings, Made to Order
Any Quantity—One or One Thousand
Send Sketch or Sample for Quotation

Catalog Upon Request

The Gwilliam Company
360 Furman St. Brooklyn, N. Y.

ENGINEERING—DESIGNING

- PRODUCT
- PRODUCTION
- CONSULTING

M. C. E. PRODUCTS

Centrifugal Babbiting Machines
Nut Castelling Machines
Special Machines

Manufacturers' Consulting Engineers

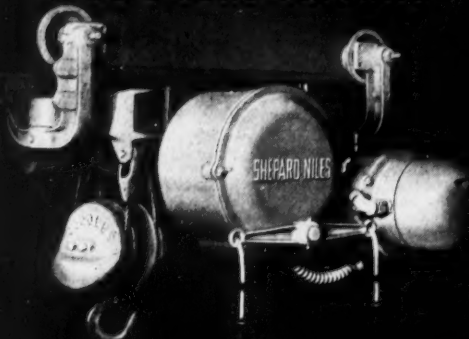
L. W. MOULTON.
Syracuse Building, SYRACUSE, N. Y.

SHEPARD NILES

DIRECT WORM DRIVE

Electric Hoists

1/4 TO 6 TONS CAPACITY



CLOSE HEADROOM, AUTOMATIC LUBRICATION,
ROPE OR PUSH BUTTON CONTROL, ANTI-
FRICTION BEARINGS. WRITE FOR BULLETIN

SHEPARD NILES CRANE & HOIST CORP.

444 Schuyler Ave., Montour Falls, N. Y. Export: 111 B'dway, N. Y. C.

MOST COMPREHENSIVE LINE OF CRANES & HOISTS

COLTON HIGH SPEED TWIST DRILLS

will solve your drilling problems

"Black Devil"

KA-2 Bakelite Oil Hole
Gun Concave Special Spiral
Special and Standard Types
for all purposes

ARTHUR COLTON COMPANY

2818 Jefferson Ave., E.

DETROIT, MICH.

"Lift and Carry with MORGANS"

Modern shop transportation equipment—a complete line—
saves time, lowers handling costs on all classes of work.
Also Steam Hammers, Forging Presses, Hydraulic Presses,
Mill Machinery. Send for details.

MORGAN

**MORGAN
ENGINEERING
COMPANY**

ALLIANCE, OHIO

NEW YORK PITTSBURGH

CRANES

Ford Chain Blocks Do Not Creep

THEY HOLD THEIR LOAD

• Ford Tribloc design and quality of materials employed assure safety, durability, ease and speed of operation... The Ford Tribloc does not creep—it holds its load indefinitely... This is a factor of no mean importance to the particular buyer.

FORD CHAIN BLOCK COMPANY

An Associate Company of the
American Chain Company, Inc.
Philadelphia, Pa.

**IN BUSINESS FOR
YOUR SAFETY**



ACCO

FORD CHAIN BLOCKS



The Pronto Quick Operating and Wide Opening Lever Vises

Designed for Milling and Drilling Machines and are especially
adapted for any work where a large number of pieces
are to be quickly handled. MADE IN THREE SIZES.



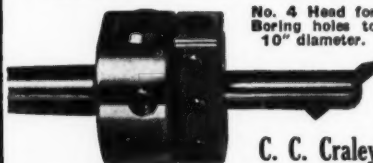
No. 1 6 3/4" long-8 lbs.
\$50.00
No. 1 1/2 8 3/4" long-17 lbs.
\$60.00
No. 2 9 3/4" long-33 lbs.
\$70.00
Prices subject to discount of 45%

Manufactured by

EDW. PURVIS & SON

110 YORK ST. Successor to Carter & Hakes BROOKLYN, N. Y.

CRALEY OFF-SET BORING HEAD



No. 4 Head for
Boring holes to
10" diameter.

These Boring Head
Sets are made in
six sizes.

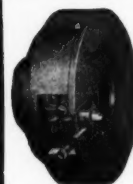
Write for Prices.

C. C. Craley Mfg. Co., Shillington, Pa.

Face While Boring

M-D Facing Head can be attached to Column Boring Bar, and Drilling or Milling Machine spindles. Single point tool travels radially, from center outward or reverse, feeds automatically, and covers faces 6" to 30". Write for prices.

MUMMERT-DIXON COMPANY
HANOVER, PA.



For Drill Press. Often used on Miller, Shaper or Planer. 6", 9" and 12" Jaws.

or
H. S. Drilling
Attachment

Increases the
Speed 3 Times

Send for
Circulars
of ALL

THE
GRAHAM MFG. CO.
71 Willard Ave., Providence, R. I.

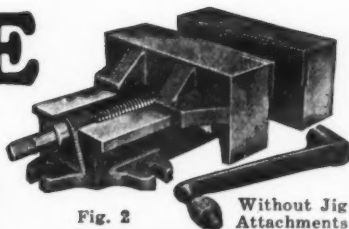
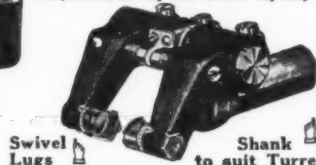


Fig. 2

Without Jig
Attachments

For Turret Lathe
Adjustable to any size within capacity



Swivel
Lugs

Shank
to suit Turret

Prevents Scaling and Distortion in Hardening
HIGH SPEED STEEL

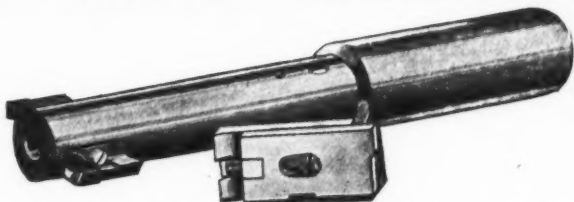
Also, we do Skilled Hardening and Heat-Treating of
every kind, and guarantee the results.

THE BENNETT METAL TREATING COMPANY, Elmwood, Conn.



for every industrial requirement

American Gas Furnace Co.
Elizabeth, New Jersey



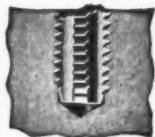
—and this at higher speeds! The floating cutter on
MADISON BORING BARS compensates for possible mis-
alignments. Adjustable to .00025". The result is—far greater
accuracy and a tremendous increase in production—400%
in some cases. Straight holes from 5/8" up are guaranteed.
Write for circular, estimates or suggestions.

Madison Manufacturing Co., Muskegon, Mich.



Case Hardening—Nitriding—
Hardening—Tempering—Anneal-
ing—Gun Metal Coloring, Etc.

American Metal Treatment Co.
Elizabeth - New Jersey



Remove the broken tap easily and quickly
with a Walton. It saves the piece—and
also the thread. All sizes—3/16" to 1 1/4";
other sizes to order. Write for a catalog.

THE WALTON COMPANY
92 ALLYN ST., HARTFORD, CONN.

Every executive responsible for results should
know that a small cutting tool such as a tap can
make or break a machine's productivity.

Do you equip your machines on a price or per-
formance basis? Watch results.

Low prices and maximum performance seldom go
together. Card Quality at the market price is a
good safe buy in taps. Production considered, they
show low tapping cost per piece.

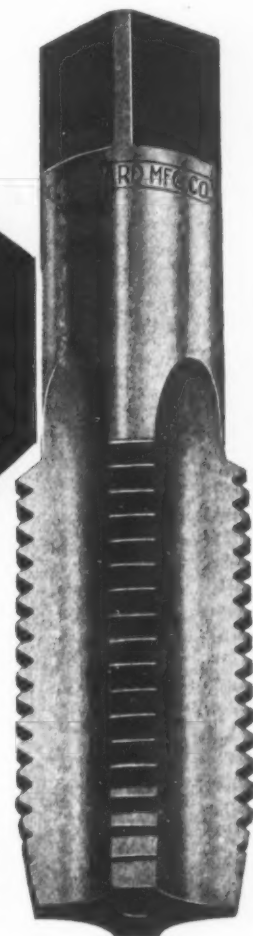
Card COMMERCIAL Ground Thread Taps—
H.S. steel correctly heat treated—ground
after hardening—for production threading
requiring Class 2 fit.

Card PRECISION Ground Thread Taps—for
most accurate work. Card Cut Thread Taps
for average work.

1874



1936



Send for catalog No.
33 and look over the
line. Carbon, High
Speed Cut, and High
Speed Ground Thread
Taps. Sold by lead-
ing dealers.

Division of Union Twist Drill Co.

MANSFIELD, MASS., U. S. A.

NEW YORK: 61 Reade St. DETROIT: 6540 Antoine St.
CHICAGO: 11 So. Clinton St. SAN FRANCISCO: 121 Second St.

#

MACHINERY'S PRODUCT INDEX

FOR LOCATION OF ADVERTISEMENTS OF MANUFACTURERS LISTED IN THIS INDEX SEE ALPHABETICAL INDEX, PAGE 134

ABRASIVE CLOTH AND PAPER

Behr-Manning Corp., Div. Norton Co., Troy, N. Y.
Carborundum Co., Niagara Falls, N. Y.
Walls Sales Corp., 96 Warren St., New York, N. Y.

ACCUMULATORS, HYDRAULIC

Elmes, Chas. F., Engineering Works, 222 N. Morgan St., Chicago.
Morgan Engineering Co., Alliance, O.

AIR HOISTS

See Hoists, Air.

AIR TOOLS

See Grinders, Pneumatic; Drills, Portable Pneumatic, etc.

ALLOYS, STEEL, TUNGSTEN, VANADIUM, MANGANESE, ETC.

Carboloy Co., Inc., Detroit, Mich.
Carnegie-Illinois Steel Corp., (U.S. Steel Corp. Sub.) Pittsburgh, Pa.
Carpenter Steel Co., Reading, Pa.
Haynes Stellite Co., Kokomo, Ind.
Ryerson, Joseph T. & Son, Inc., 2558 West 16th St., Chicago, Ill.
Vanadium Alloys Steel Co., Latrobe, Pa.
Van Norman Mch. Tool Co., Springfield, Mass.

ALLOYS, ZINC

New Jersey Zinc Co., 160 Front St., New York City.
Ryerson, Joseph T. & Son, Inc., 2558 West 16th St., Chicago, Ill.

ARBOR PRESSES

See Presses, Arbor

ARBORS AND MANDRELS, EXPANDING AND SOLID

Brown & Sharpe Mfg. Co., Providence, Cleveland Twist Drill Co., Cleveland, O.
Davis Boring Tool Co., Inc., 6200 Maple Ave., St. Louis, Mo.
Greenfield Tap & Die Corp., Greenfield, Mass.
Hannifin Mfg. Co., 621-631 S. Kolmar Ave., Chicago.
Morse Twist Drill & Machine Co., New Bedford, Mass.
National Twist Drill & Tool Co., Detroit, Mich.
Pratt & Whitney Co., Hartford, Conn.
Standard Tool Co., Cleveland, O.
Union Twist Drill Co., Athol, Mass.

BABBITT

Ryerson, Joseph T. & Son, Inc., 2558 West 16th St., Chicago, Ill.

BALANCING EQUIPMENT

Gisholt Machine Co., Madison, Wis.
Norton Co., Worcester, Mass.
Sundstrand Mch. Tool Co., Rockford, Ill.

BALLS, BRASS, STEEL, ETC.

William Co., 360 Furman St., Brooklyn, N. Y.
Hoover Ball & Bearing Co., Ann Arbor, Mich.
S K F Industries, Inc., Philadelphia.
Waterbury Steel Ball Co., Inc., Poughkeepsie, N. Y.

BAR, BORING

See Boring Bars.

BAR, PHOSPHOR BRONZE

Bunting Brass & Bronze Co., Toledo, O.
Ryerson, Joseph T. & Son, Inc., 2558 West 16th St., Chicago, Ill.

BAR, STEEL

Carnegie-Illinois Steel Co., Pittsburgh, Pa.
Ryerson, Joseph T. & Son, Inc., 2558 West 16th St., Chicago, Ill.

BEARINGS, BABBITT

Bunting Brass & Bronze Co., Toledo, O.
Johnson Bronze Co., New Castle, Pa.
Link-Belt Co., Chicago.
Wood's, T. B., Sons Co., Chambersburg, Pa.

BEARINGS, BALL

Bantam Ball Bearing Co., South Bend, Ind.
Bearings Co. of America, Lancaster, Pa.
Boston Gear Works, Inc., North Quincy, Mass.
Ex-Cell-O Aircraft & Tool Corp., Detroit, Mich.
Fafnir Bearing Co., New Britain, Conn.
Federal Bearing Co., Inc., Poughkeepsie, N. Y.
Gwilliam Co., 360 Furman St., Brooklyn, N. Y.
Hoover Ball & Bearing Co., Ann Arbor, Mich.
Marlin-Rockwell Corp., Jamestown, N. Y.
New Departure Mfg. Co., Bristol, Conn.
Nice Ball Bearing Co., Philadelphia, Pa.
Norma-Hoffmann Bearings Corp., Stamford, Conn.
Schatz Mfg. Co., Poughkeepsie, N. Y.
S K F Industries, Inc., Philadelphia.
Torrington Co., Torrington, Conn.
Wood's, T. B., Sons Co., Chambersburg, Pa.

BEARINGS, BRONZE AND SPECIAL ALLOYS

Bunting Brass & Bronze Co., Toledo, O.
Haynes Stellite Co., Kokomo, Ind.
Johnson Bronze Co., New Castle, Pa.
Morgan Engineering Co., Alliance, O.

BEARINGS, LINESHAFT

Fafnir Bearing Co., New Britain, Conn.
Hyatt Roller Bearing Co., Newark, N. J.
Link-Belt Co., Chicago.
Shafer Bearing Corp., 6519 W. Grand Ave., Chicago.
S K F Industries, Inc., Philadelphia.
Wood's, T. B., Sons Co., Chambersburg, Pa.

BEARINGS, OILLESS

Arguto Oilless Bearing Co., 145 Berkley St., Wayne Junction, Philadelphia.
Manhattan Rubber Mfg. Div. Raybestos-Manhattan, Inc., Passaic, N. J.
Wood's, T. B., Sons Co., Chambersburg, Pa.

BEARINGS, QUILL

Bantam Ball Bearing Co., South Bend, Ind.

BEARINGS, ROLLER

Bantam Ball Bearing Co., South Bend, Ind.

BEARINGS, ROLLER

Fafnir Bearing Co., New Britain, Conn.
Gwilliam Co., 360 Furman St., Brooklyn, N. Y.
Hoover Ball & Bearing Co., Ann Arbor, Mich.

Hyatt Roller Bearing Co., Newark, N. J.
Norma-Hoffmann Bearings Corp., Stamford, Conn.

Shafer Bearing Corp., 6519 West Grand Ave., Chicago.

S K F Industries, Inc., Philadelphia.

Timken Roller Bearing Co., Canton, O.

BEARINGS, TAPERED ROLLER

Bantam Ball Bearing Co., South Bend, Ind.

Timken Roller Bearing Co., Canton, O.

BEARINGS, THRUST

Bantam Ball Bearing Co., South Bend, Ind.

Bearings Co. of America, Lancaster, Pa.

Boston Gear Works, Inc., North Quincy, Mass.

Fafnir Bearing Co., New Britain, Conn.

General Electric Co., Schenectady, N. Y.

Gwilliam Co., 360 Furman St., Brooklyn, N. Y.

Nice Ball Bearing Co., Philadelphia, Pa.

Norma-Hoffmann Bearings Corp., Stamford, Conn.

Shafer Bearing Corp., 6519 W. Grand Ave., Chicago.

S K F Industries, Inc., Philadelphia.

Timken Roller Bearing Co., Canton, O.

BELT DRIVES, MULTIPLE V

Worthington Pump & Machinery Corp., Harrison, N. J.

BELT FASTENERS, METAL, LEATHER, ETC.

Greene, Tweed & Co., 109 Duane St., New York City.

Manhattan Rubber Mfg. Div. Raybestos-Manhattan, Inc., Passaic, N. J.

Wood's, T. B., Sons Co., Chambersburg, Pa.

BELT LACING

Houghton, E. F. & Co., Philadelphia, Pa.

BELT SHIFTERS

Haskins, R. G. Co., 4634 Fulton St., Chicago.

LeBlond, R. K. Mch. Tool Co., Cincinnati, O.

Ready Tool Co., Bridgeport, Conn.

Wood's, T. B., Sons Co., Chambersburg, Pa.

BELTING, TRANSMISSION

Houghton, E. F. & Co., Philadelphia, Pa.

Manhattan Rubber Mfg. Div. Raybestos-Manhattan, Inc., Passaic, N. J.

BELTS, LEATHER

Houghton, E. F. & Co., Philadelphia, Pa.

BELTS, V-

Allis-Chalmers Mfg. Co., Milwaukee, Wis.

Manhattan Rubber Mfg. Div. Raybestos-Manhattan, Inc., Passaic, N. J.

Wood's, T. B., Sons Co., Chambersburg, Pa.

BENCH LEGS

New Britain-Gridley Mch. Co., New Britain, Ct.

Standard Pressed Steel Co., Jenkintown, Pa.

BENDING MACHINES, ANGLE IRON

Buffalo Forge Co., Buffalo, New York.

Consolidated Machine Tool Corporation, Rochester, N. Y.

BENDING MACHINES, HYDRAULIC

Morgan Engineering Co., Alliance, O.

BENDING MACHINES, PIPE

Buffalo Forge Co., Buffalo, New York.

BLOCKS, CHAIN

See Hoists, etc.

BLOWERS

Allis-Chalmers Mfg. Co., Milwaukee, Wis.
American Gas Furnace Co., Elizabeth, N. J.
Buffalo Forge Co., Buffalo, New York.
General Electric Co., Schenectady, N. Y.
Leiman Bros., Inc., Newark, N. J.

BLUEPRINT MACHINERY AND ACCESSORIES

Pease, C. F. Co., 822 No. Franklin St., Chicago.

BLUEPRINT PAPER

Pease, C. F. Co., 822 No. Franklin St., Chicago.

BOILER TUBES

National Tube Co., (U.S. Steel Corp. Sub.) Pittsburgh, Pa.
Ryerson, Joseph T. & Son, Inc., 2558 West 16th St., Chicago, Ill.

BOLT AND NUT MACHINERY

Acme Machinery Co., Cleveland.
Landis Mch. Co., Inc., Waynesboro, Pa.
National Acme Co., Cleveland, O.
Waterbury Farrel Fdry. & Mch. Co., Waterbury, Ct.

BOLTS AND NUTS

National Acme Co., Cleveland, O.

BOOKS, TECHNICAL

Industrial Press, 148 Lafayette St., New York.

BOOSTERS

American Gas Furnace Co., Elizabeth, N. J.

BORING AND DRILLING MACHINES, VERTICAL

Baker Brothers, Inc., Toledo, O.
Barnes Drill Co., 814 Chestnut St., Rockford, Ill.
Barnes, W. F. & John Co., Rockford, Ill.

Bulford Co., Bridgeport, Conn.

Gisholt Machine Co., Madison, Wis.

Gorton, Geo. Machine Co., 1109 13th St., Racine, Wis.

Ingersoll Milling Mch. Co., Rockford, Ill.

Moline Tool Co., Moline, Ill.

Rockford Drilling Machine Co., Rockford, Ill.

BORING AND TURNING MILLS, VERTICAL

Bulford Co., Bridgeport, Conn.

Cincinnati Planer Co., Cincinnati, O.

Consolidated Machine Tool Corporation, Rochester, N. Y.

Gisholt Machine Co., Madison, Wis.

Hannifin Mfg. Co., 621 S. Kolmar Ave., Chicago.

Lovejoy Tool Co., Inc., Springfield, Vt.

Madison Mfg. Co., Muskegon, Mich.

McCrosky Tool Corp., Meadville, Pa.

Ready Tool Co., Bridgeport, Conn.

Williams, J. H. & Co., 75 Spring St., New York City.

BORING, DRILLING AND MILLING MACHINES, HORIZONTAL

Barnes, W. F. & John Co., Rockford, Ill.

Consolidated Machine Tool Corporation, Rochester, N. Y.

Harnischfeger Corp., Milwaukee, Wis.

Ingersoll Milling Mch. Co., Rockford, Ill.

Landis Tool Co., Waynesboro, Pa.

Lucas Mch. Tool Co., Cleveland, O.

Rockford Drilling Machine Co., Rockford, Ill.

Universal Boring Machine Co., Hudson, Mass.

BORING HEADS

Crable, C. C. Mfg. Co., Shillington, Pa.

Davis Boring Tool Co., Inc., 6200 Maple Ave., St. Louis, Mo.

McCrosky Tool Corp., Meadville, Pa.

Precision Tool Co., Bridgeport, Conn.

BORING HEADS, OFFSET

Precision Tool Co., Bridgeport, Conn.

Westcott Chuck Co., Oneida, New York.

BORING MACHINES, DIAMOND AND CARBIDE TOOLS

Ex-Cell-O Aircraft & Tool Corp., Detroit, Mich.

Heald Machine Co., Worcester, Mass.

Stokerunit Corp., Milwaukee, Wis.

BORING MACHINES, JIG

Pratt & Whitney Co., Hartford, Conn.

BORING TOOLS

Armstrong Brothers Tool Co., 313 N. Francisco Ave., Chicago.

Carboloy Co., Inc., Detroit, Mich.

Davis Boring Tool Co., Inc., 6200 Maple Ave., St. Louis, Mo.

Hannifin Mfg. Co., 621 S. Kolmar Ave., Chicago.

Kernshaw, F. A., Kent, O.

Lovejoy Tool Co., Inc., Springfield, Vt.

McCrosky Tool Corp., Meadville, Pa.

Morse Twist Drill & Machine Co., New Bedford, Mass.

Precision Tool Co., Bridgeport, Ct.
Ready Tool Co., Bridgeport, Conn.
Union Twist Drill Co., Athol, Mass.
Williams, J. H. & Co., 75 Spring St., New York City.

BRAKES, PRESS AND BENDING

Schatz Mfg. Co., Poughkeepsie, N. Y.

BRAZING EQUIPMENT

American Gas Furnace Co., Elizabeth, N. J.

BROACHES

Carboloy Co., Inc., Detroit, Mich.
Colonial Broach Co., Detroit, Mich.
Ex-Cell-O Aircraft & Tool Corp., Detroit, Mich.
Illinois Tool Works, 2501 North Keeler Ave., Chicago, Ill.

BROACHING MACHINES

Cincinnati Milling Machine Co., Oakley, Cincinnati.

Colonial Broach Co., Detroit, Mich.

Foot-Burt Co., Cleveland, O.

Oilgear Co., Milwaukee, Wis.

V & O Press Co., Hudson, N. Y.

BROACH SHARPENING MACHINES

Colonial Broach Co., Detroit, Mich.

BRONZE

Bunting Brass & Bronze Co., Toledo, O.
Johnson Bronze Co., New Castle, Pa.
Morgan Engineering Co., Alliance, O.
Ryerson, Joseph T. & Son, Inc., 2558 West 16th St., Chicago, Ill.

BUFFERS

Gardner Machine Co., 414 E. Gardner St., Beloit, Wis.
New Britain-Gridley Mch. Co., New Britain, Ct.

BULLDOZERS

Bliss, E. W. Co., Toledo, O.

Schatz Mfg. Co., Poughkeepsie, N. Y.

BURNERS, GAS AND OIL

American Gas Furnace Co., Elizabeth, N. J.

Leiman Bros., Inc., Newark, N. J.

BURNISHING MACHINERY

Baird Machine Co., Bridgeport, Conn.

BUSHINGS, BRASS, BRONZE, ETC.

Boston Gear Works, Inc., North Quincy, Mass.

Bunting Brass & Bronze Co., Toledo, O.

Haynes Stellite Co., Kokomo, Ind.

Johnson Bronze Co., New Castle, Pa.

Morgan Engineering Co., Alliance, O.

BUSHINGS, HARDENED

Baumbach, E. A. Mfg. Co., 1810 S. Kilbourn Ave., Chicago.

Leland-Gifford Co., Worcester, Mass.

BUSHINGS, JIG

Colonial Broach Co., Detroit, Mich.

Ex-Cell-O Aircraft & Tool Corp., Detroit, Mich.

Universal Engineering Co., Frankenthum, Mich.

CABINETS, FILING

Pease, C. F. Co., 822 No. Franklin St., Chicago.

CABINETS, TOOL

Armstrong Brothers Tool Co., 313 N. Francisco Ave., Chicago.

Morse Twist Drill & Machine Co., New Bedford, Mass.

CALIPERS

Brown & Sharpe Mfg. Co., Providence, Scherr, Geo. Co., 128 Lafayette St., New York City.

Starrett, L. S. Co., Athol, Mass.

CAM CUTTING MACHINES

Frew Machine Co., Philadelphia, Pa.

CAMS

Hartford Special Mchry. Co., Hartford, Conn.

Kux-Lohner Machine Co., 2145-47 Lexington St., Chicago.

Rowbottom Machine Co., Waterbury, Conn.

CASE-HARDENING

American Gas Furnace Co., Elizabeth, N. J.

American Metal Treatment Co., Elizabeth, N. J.

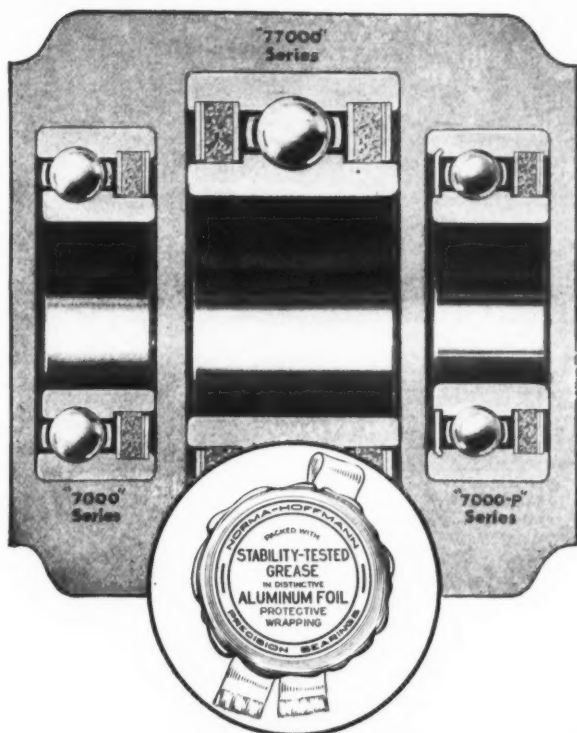
Williams, J. H. & Co., 75 Spring St., New York City.

CASE-HARDENING FURNACES

See Furnaces, Heat Treating.

CASTINGS, BRASS, BRONZE AND ALUMINUM

SELF-SEALED



NORMA-HOFFMANN "GreaSeal" Felt-Protected PRECISION Ball Bearings have the following outstanding advantages:

Thick, closely-fitting felts between removable plates, forming an effective labyrinth against recessed inner ring.

FELT SEAL REMOVABLE in its entirety, for inspection, cleaning, or renewal of grease.

Wide inner and outer rings, with maximum contact on shaft and housing, make inserts in housing unnecessary and militate against slippage, looseness, and escape of lubricant past outer ring.

Felt seal entirely within confines of both rings; therefore not exposed to injury.

Seal construction avoids race distortion, assuring dimensional exactness and quiet running.

Grease capacity ample for long periods.

Write for the Catalog. Let our engineers work with yours.

"NORMA-HOFFMANN"

PRECISION BEARINGS

NORMA-HOFFMANN BEARINGS CORPORATION, STAMFORD, CONN., U. S. A.

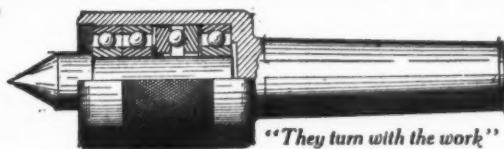


TWIST DRILLS, REAMERS, HOBS,
MILLING CUTTERS, SPECIAL TOOLS

NATIONAL TWIST DRILL & TOOL CO.
DETROIT, U. S. A.

Tap & Die Division—WINTER BROS. CO., WRENTHAM, MASS.

"ALIVE"
Ball
Bearing
Centers



MODERN MACHINE CORP., 285-287 North 6th St., Brooklyn, N. Y.

LOVEJOY TOOL CO., INC.
SPRINGFIELD, VERMONT, U.S.A.
POSITIVE METAL CUTTING TOOLS
INSERTED CUTTER TYPE
TURNING, BORING AND MILLING.

Remove Hardening Scale . . . Clean Castings and Stampings

For Quicker
and Better
MACHINING
PLATING
ENAMELING
and **PAINING**
MAT and SATIN
FINISHING
without acids

• *Uniform
quality of finish
from day to day
— no blotches or
streaks.*

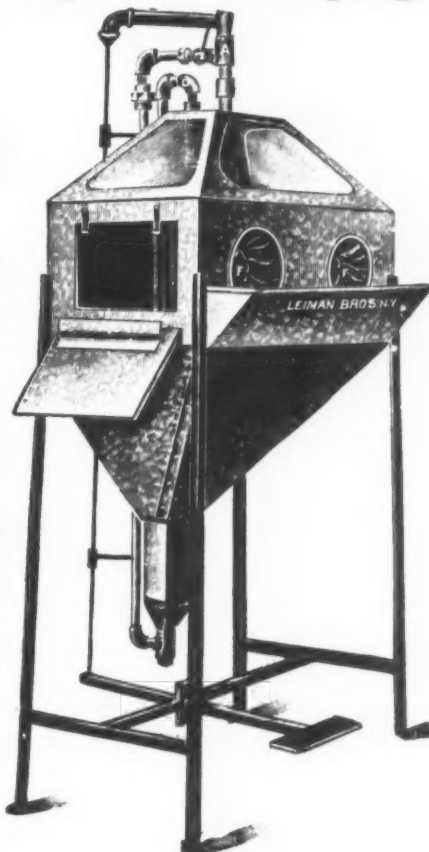
LEIMAN BROS.
PATENTED
CONTINUOUS FEED
**SAND
BLAST**

*A pile of sand lasts
for many days*

LEIMAN BROS., Inc.
139 (8) Christie St.
NEWARK, N. J.

LEIMAN BROS.
N. Y. CORP.
23 (F8) Walker Street
New York City

Or Your Dealer
MAKERS OF GOOD
MACHINERY FOR
OVER 45 YEARS



CEMENT, DISC GRINDING WHEEL
Gardner Machine Co., 414 E. Gardner St., Beloit, Wis.
Hanchett Mfg. Co., Big Rapids, Mich.
Walls Sales Corp., 96 Warren St., New York, N. Y.

CENTERING MACHINES
Hanson-Whitney Machine Co., Hartford, Conn.
Harnischfeger Corp., Milwaukee, Wis.
Pratt & Whitney Co., Hartford, Conn.
Sundstrand Machine Tool Co., Rockford, Ill.

CENTERS, LATHE
Haynes Stellite Co., Kokomo, Ind.
Modern Machine Corp., 285 N. 6th St., Brooklyn, N. Y.
Ready Tool Co., Bridgeport, Conn.

CENTERS, PLANNER AND MILLER
Cincinnati Planer Co., Cincinnati, O.
Morse Twist Drill & Machine Co., New Bedford, Mass.

CHAIN BLOCKS
See Hoists, Chain, etc.

CHAIN DRIVES
Baldwin-Duckworth Chain Corp., Worcester and Springfield, Mass.
Boston Gear Works, Inc., North Quincy, Mass.
Link-Belt Co., Chicago.
Morse Chain Co., Ithaca, N. Y.
Philadelphia Gear Works, Philadelphia.
Ramsey Chain Co., Inc., Albany, New York.
Whitney Chain & Mfg. Co., Hartford, Ct.

CHAINS, POWER TRANSMISSION AND CONVEYOR
Baldwin-Duckworth Chain Corp., Worcester and Springfield, Mass.
Boston Gear Works, Inc., North Quincy, Mass.
Link-Belt Co., Chicago.
Philadelphia Gear Works, Philadelphia.
Whitney Chain & Mfg. Co., Hartford, Ct.

CHAMFERING MACHINES
Grant Mfg. & Mch. Co., N. W. Station, Bridgeport, Conn.
Schatz Mfg. Co., Poughkeepsie, N. Y.

CHUCKING MACHINES
Bard Machine Co., Bridgeport, Conn.
Brown & Sharpe Mfg. Co., Providence.
Bullard Co., Bridgeport, Conn.
Gisholt Machine Co., Madison, Wis.
Goss & De Leeuw Machine Co., New Britain, Ct.
Jones & Lamson Machine Co., Springfield, Vt.
National Acme Co., Cleveland, O.
New Britain-Gridley Mch. Co., New Britain, Ct.
Potter & Johnston Machine Co., Pawtucket, R. I.
Sundstrand Machine Tool Co., Rockford, Ill.

CHUCKING MACHINES, MULTIPLE SPINDLE
Goss & De Leeuw Machine Co., New Britain, Ct.
National Acme Co., Cleveland, O.

CHUCKS, AIR-OPERATED
Hannifin Mfg. Co., 621 S. Kolmar Ave., Chicago.
Skinner Chuck Co., New Britain, Conn.

CHUCKS, COLLET OR SPLIT
Ames, B. C. Co., Waltham, Mass.
Hardinge Brothers, Inc., Elmira, N. Y.
Rivett Lathe & Grinder, Inc., Brighton, Boston, Mass.

CHUCKS, DIAPHRAGM
Van Norman Mch. Tool Co., Springfield, Mass.

CHUCKS, DRILL
Cleveland Twist Drill Co., Cleveland, O.
Consolidated Mch. Tool Corp. of America, Rochester, N. Y.
McCroskey Tool Corp., Meadville, Pa.
Modern Tool Works (Consolidated Mch. Tool Corp.), Rochester, N. Y.
Morse Twist Drill & Machine Co., New Bedford, Mass.
National Twist Drill & Tool Co., Detroit, Mich.
Proconier Safety Chuck Co., 20 S. Clinton St., Chicago, Ill.
Skinner Chuck Co., New Britain, Conn.
Standard Tool Co., Cleveland, O.
Watts Bros. Tool Wks., Wilmerding, Pa.
Westcott Chuck Co., Oneida, New York.

CHUCKS, FULL FLOATING
Errington Mechanical Laboratory, 200 Broadway, New York.
Gisholt Machine Co., Madison, Wis.
Watts Bros. Tool Wks., Wilmerding, Pa.

CHUCKS, LATHE, ETC.
Bullard Co., Bridgeport, Conn.
Frew Machine Co., Philadelphia, Pa.
Hardinge Brothers, Inc., Elmira, N. Y.
Rivett Lathe & Grinder, Inc., Brighton, Boston, Mass.
Skinner Chuck Co., New Britain, Conn.
Westcott Chuck Co., Oneida, New York.

CHUCKS, MAGNETIC
Heald Machine Co., Worcester, Mass.
Walker, O. S. Co., Inc., Worcester, Mass.

CHUCKS, QUICK CHANGE AND SAFETY
Errington Mechanical Laboratory, 200 Broadway, New York.
Geometric Tool Co., New Haven, Conn.
McCroskey Tool Corp., Meadville, Pa.
Proconier Safety Chuck Co., 20 S. Clinton St., Chicago, Ill.

CHUCKS, RING WHEEL
Gardner Machine Co., 414 E. Gardner St., Beloit, Wis.
Graham Mfg. Co., Providence, R. I.
Hanchett Mfg. Co., Big Rapids, Mich.

CHUCKS, TAPPING
Barber-Colman Co., Rockford, Ill.
Errington Mechanical Laboratory, 200 Broadway, New York.
McCroskey Tool Corp., Meadville, Pa.
Proconier Safety Chuck Co., 20 S. Clinton St., Chicago, Ill.
Watts Bros. Tool Wks., Wilmerding, Pa.

CLAMPS
Armstrong Brothers Tool Co., 313 N. Francisco Ave., Chicago.
Starrett, L. S. Co., Athol, Mass.
Williams, J. H. & Co., 75 Spring St., New York City.

CLEANERS, CHEMICAL, FOR WASTE AND METAL
Houghton, E. F. & Co., Philadelphia, Pa.
Oakite Products, Inc., 26 Thames St., New York City.

CLUTCHES
Barnes Drill Co., 814 Chestnut St., Rockford, Ill.
Conway Clutch Co., Cincinnati.
Link-Belt Co., Chicago.
Morse Chain Co., Ithaca, N. Y.
Production Mch. Co., Greenfield, Mass.
Ramsey Chain Co., Inc., Albany, New York.
Rockford Drilling Mch. Co., Rockford, Ill.
Twin Disc Clutch Co., Racine, Wis.
Wood's T. B. Sons Co., Chambersburg, Pa.

COLLARS, SAFETY
Link-Belt Co., Chicago.
Standard Pressed Steel Co., Jenkintown, Pa.
Wood's T. B. Sons Co., Chambersburg, Pa.

COLLETS
Brown & Sharpe Mfg. Co., Providence.
Cleveland Twist Drill Co., Cleveland, O.
Geometric Tool Co., New Haven, Conn.
Hardinge Brothers, Inc., Elmira, N. Y.
Morrison Machine Products, Inc., Elmira, N. Y.
Pratt & Whitney Co., Hartford, Conn.
Standard Tool Co., Cleveland, O.
Union Twist Drill Co., Athol, Mass.

COLLETS, SPRING
Ames, B. C. Co., Waltham, Mass.
Hardinge Brothers, Inc., Elmira, N. Y.
Rivett Lathe & Grinder, Inc., Brighton, Boston, Mass.

COMPARATORS, SCREW THREAD
Bauch & Lomb Optical Co., 619 St. Paul St., Rochester, New York.
Jones & Lamson Machine Co., Springfield, Vt.
Scherr, Geo. Co., 128 Lafayette St., New York City.



DILLYDALLY METHODS WASTE MONEY

WHEN production machinery's delayed, time wastes mount high on your cost sheets. Don't blame machine tool operators who have to wait for frequent crane service. Install Zip-Lifts for fast "spot handling"—let skilled machinists handle their own loads—get more out of machines—cut costs.

On this shaft grinding operation, for example, the operator previously lost an average of 80 minutes per day waiting for crane service. He turned out 14 shafts per day. Now, with a Zip-Lift, his production has increased from 14 to 16 shafts per 8-hour shift.

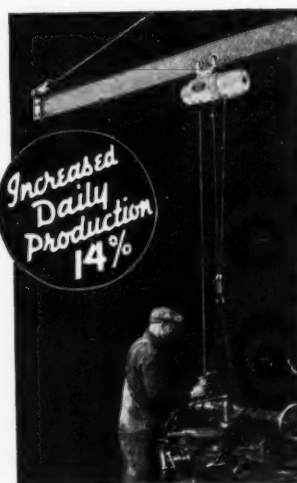
"Spot handling" with the Zip-Lift pays a big return on a very small investment. A post card will bring you a copy of the new folder on "Spot Handling."

Write for it today.

HARNISCHFEGGER CORPORATION
ESTABLISHED 1884
4536 W. National Ave., Milwaukee, Wis.

Zip-LIFT

**STOPS WASTE
WITH "SPOT HANDLING"**



**THESE THREE HAVE
WON THEIR STRIPES
IN SERVICE**



“AGRIPPA” TOOL HOLDERS

• All “Agrippas” are drop-forged, carefully broached and specially hardened to insure a solid cutter-seat and a clean-cutting, chatter-proof tool. Their service record has earned them an enviable reputation as “The Holders that Hold.” Patterns for all regular operations of lathe, planer and shaper.

“VULCAN” HOIST HOOKS

• First choice of wise buyers for 40 years, “VULCANS” are drop-forged from specially selected steel. Heat-treated for maximum strength and toughness...individually proof-tested for safety. Furnished in both Shank and Eye patterns. Sizes, ½ to 25 tons. Look for the orange tip.

“VULCAN” EYE BOLTS

• Preferred for their safety, strength and dependability, Williams’ “Vulcan” Eye Bolts (weldless) are drop-forged, heat-treated and individually proof-tested. Plain and Shoulder patterns, shanks blank or threaded...complete range of sizes up to 16 tons capacity.

BUY FROM YOUR DISTRIBUTOR

J. H. WILLIAMS & CO.

75 Spring Street - - - - - New York City

Headquarters for: Drop-Forged Wrenches (Carbon and Alloy), Detachable Socket Wrenches, “C” Clamps, Lathe Dogs, Tool Holders, Eye Bolts, Hoist Hooks, Thumb Nuts and Screws, Chain Pipe Tongs and Vises, etc.



WILLIAMS
SUPERIOR DROP-FORGED TOOLS

COMPOUND, CLEANING

Houghton, E. F., & Co., Philadelphia, Pa.
Oakite Products, Inc., 26 Thames St., New York City.

COMPOUND, CUTTING, GRINDING ETC.

Houghton, E. F., & Co., Philadelphia, Pa.
Oakite Products, Inc., 26 Thames St., New York City.
Sun Oil Co., Philadelphia.

COMPOUNDS, RESIN

Bakelite Corp., 247 Park Ave., New York, N. Y.

COMPRESSORS, AIR

Allis-Chalmers Mfg. Co., Milwaukee, Wis.
General Electric Co., Schenectady, N. Y.

CONTRACT WORK

Bliss, E. W., Co., Toledo, O.
Columbus Die, Tool & Machine Co., Columbus, O.
Dieffendorf Gear Corp., Syracuse, N. Y.
Gisholt Machine Co., Madison, Wis.

Hartford Special Machinery Co., Hartford, Conn.

Illinois Tool Works, 2501 North Keeler Ave., Chicago, Ill.
Langelier Mfg. Co., Providence, R. I.

LeBlond, R. K., Mch. Tool Co., Cincinnati, O.
Modern Machine Corp., 285 N. 6th St., Brooklyn, N. Y.

Morgan Engineering Co., Alliance, O.
Munamert-Dixon Co., Hanover, Pa.
National Acme Co., Cleveland, O.

New Britain-Gridley Mch. Co., New Britain, Ct.
Pratt & Whitney Co., Hartford, Conn.

Ruthman Machinery Co., 534-536 E. Front St., Cincinnati, O.

Taylor-Shantz, Inc., Rochester, N. Y.

U. S. Tool Co., Inc., Ampere, N. J.

V & O Press Co., Hudson, N. Y.

CONTROLLERS

Allen-Bradley Co., 1331 S. First St., Milwaukee, Wis.
General Electric Co., Schenectady, N. Y.

CONVEYOR ROLLS, ROLLER BEARING

Shafer Bearing Corp., 651 W. Grand Ave., Chicago.

CONVEYORS, BELT

Link-Belt Co., Chicago.

COUNTERBORES

Carboloy Co., Inc., Detroit, Mich.
Cleveland Twist Drill Co., Cleveland, O.
Ex-Cell-O Aircraft & Tool Corp., Detroit, Mich.

Haynes Stellite Co., Kokomo, Ind.
Illinois Tool Works, 2501 North Keeler Ave., Chicago, Ill.

McCroskey Tool Corp., Meadville, Pa.
Morse Twist Drill & Machine Co., New Bedford, Mass.

National Twist Drill & Tool Co., Detroit, Mich.

Pratt & Whitney Co., Hartford, Conn.

Standard Tool Co., Cleveland, O.

Starrett, L. S., Co., Athol, Mass.

Union Twist Drill Co., Athol, Mass.

COUNTERSHAFTS

Brown & Sharpe Mfg. Co., Providence.

Diamond Machine Co., Providence, R. I.

Gisholt Machine Co., Madison, Wis.

Hannifin Mfg. Co., 621 S. Kolmar Ave., Chicago.

LeBlond, R. K., Mch. Tool Co., Cincinnati, O.

Warner & Swasey Co., Cleveland.
Wood's, T. B., Sons Co., Chambersburg, Pa.

COUNTERSINKS

Ex-Cell-O Aircraft & Tool Corp., Detroit, Mich.
Greenfield Tap & Die Corp., Greenfield, Mass.

Union Twist Drill Co., Athol, Mass.

COUNTERS, REVOLUTION

Starrett, L. S., Co., Athol, Mass.

COUNTING DEVICES

Production Instrument Co., 1321 So. Wabash Ave., Chicago.
Starrett, L. S., Co., Athol, Mass.

COUPLERS, HOSE

Greene, Tweed & Co., 109 Duane St., New York City.

Hunt, C. B., & Son, Salem, Ohio.

COUPLINGS, FLEXIBLE

Ajax Flexible Coupling Co., Westfield, N. Y.

Baldwin-Duckworth Chain Corp., Worcester, and Springfield, Mass.

Boston Gear Works, Inc., North Quincy, Mass.

Link-Belt Co., Chicago.

Lovejoy Tool Wks., 5021 W. Lake St., Chicago.

Morse Chain Co., Ithaca, N. Y.

Philadelphia Gear Works, Philadelphia.

Pooler Fdry. & Mch. Co., Baltimore, Md.

Whitney Chain & Mfg. Co., Hartford, Ct.

Wood's, T. B., Sons Co., Chambersburg, Pa.

COUPLINGS, SHAFT

Ajax Flexible Coupling Co., Westfield, N. Y.

Boston Gear Works, Inc., North Quincy, Mass.

Link-Belt Co., Chicago.

Wood's, T. B., Sons Co., Chambersburg, Pa.

CRANES, ELECTRIC TRAVELING

Link-Belt Co., Chicago.
Morgan Engineering Co., Alliance, O.

Shepard Niles Crane & Hoist Corp., 444 Schuyler Ave., Montour Falls, N. Y.

CRANES, HAND TRAVELING

Harnischfeger Corp., Milwaukee, Wis.
Shepard Niles Crane & Hoist Corp., 444 Schuyler Ave., Montour Falls, N. Y.

CRANES, LOCOMOTIVE

Harnischfeger Corp., Milwaukee, Wis.
Link-Belt Co., Chicago.

CRANES, PORTABLE

Harnischfeger Corp., Milwaukee, Wis.

CRANK PIN TURNING MACHINES

Lodge & Shipley Machine Tool Co., Cincinnati.

CUTTERS, GEAR

Brown & Sharpe Mfg. Co., Providence.
Ex-Cell-O Aircraft & Tool Corp., Detroit, Mich.

Michigan Tool Co., Detroit, Mich.

Standard Tool Co., Cleveland, O.

Union Twist Drill Co., Athol, Mass.

CUTTERS, MILLING

Barber-Colman Co., Rockford, Ill.
Brown & Sharpe Mfg. Co., Providence.

Carboloy Co., Inc., Detroit, Mich.

Cleveland Twist Drill Co., Cleveland, O.

Colonial Broach Co., Detroit, Mich.

Columbus Die, Tool & Machine Co., Columbus, O.

Consolidated Mch. Tool Corp. of America, Rochester, N. Y.

Ex-Cell-O Aircraft & Tool Corp., Detroit, Mich.

Gammans-Holman Co., Manchester, Conn.

Gorton, Geo., Machine Co., 1109 18th St., Racine, Wis.

Haynes Stellite Co., Kokomo, Ind.

Illinois Tool Works, 2501 North Keeler Ave., Chicago, Ill.

Ingersoll Milling Mch. Co., Rockford, Ill.

Lovejoy Tool Co., Inc., Springfield, Vt.

McCroskey Tool Corp., Meadville, Pa.

Michigan Tool Co., Detroit, Mich.

Morse Twist Drill & Machine Co., New Bedford, Mass.

National Twist Drill & Tool Co., Detroit, Mich.

Pratt & Whitney Co., Hartford, Conn.

Reed-Prentice Corp., Worcester, Mass.

Standard Tool Co., Cleveland, O.

Union Twist Drill Co., Athol, Mass.

Whitney Chain & Mfg. Co., Hartford, Ct.

CUTTING COMPOUNDS

See Compounds, Cutting, Grinding, etc.

CUTTING-METALS OR ALLOYS

Carboloy Co., Inc., Detroit, Mich.

CUTTING-OFF MACHINES, ABRASIVE WHEEL

Armstrong Brothers Tool Co., 313 N. Francisco Ave., Chicago.

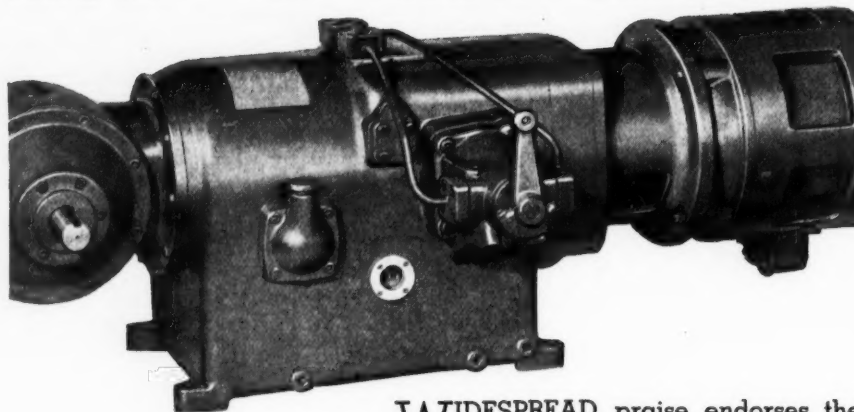
Campbell, Andrew C., Inc., Bridgeport, Ct.

Manhattan Rubber Mfg. Div. Raybestos-Manhattan, Inc., Passaic, N. J.

CUTTING-OFF MACHINES, COLD SAW

See Sawing Machines, Circular.

"THE FINEST WE HAVE EVER USED"



- ★ Smooth Acceleration and Deceleration
- ★ Accurate Stepless Speed Control . . . Minimum to Maximum in either direction
- ★ Automatic Load Indication and Overload Protection
- ★ Flexible Location with Hand, Automatic or Remote Control
- ★ High Efficiency, Low Maintenance
- ★ Smaller Size, Lower Cost

WIDESPREAD praise endorses the New Oilgear Fluid Power Variable Speed Transmission. Production men say its performance amazes them. It provides hairline accuracy of speed control; steplessly variable speed; even, positive speeds; smooth acceleration and reverse; a complete range of automatic and hand operation. The new simplified design makes Oilgear compact, widely adaptable and low in price. You will want full information about the transmission that is upsetting production figures in many lines. Bulletin 60000 sent free. THE OILGEAR COMPANY, 1310 W. Bruce St., Milwaukee, Wisc.

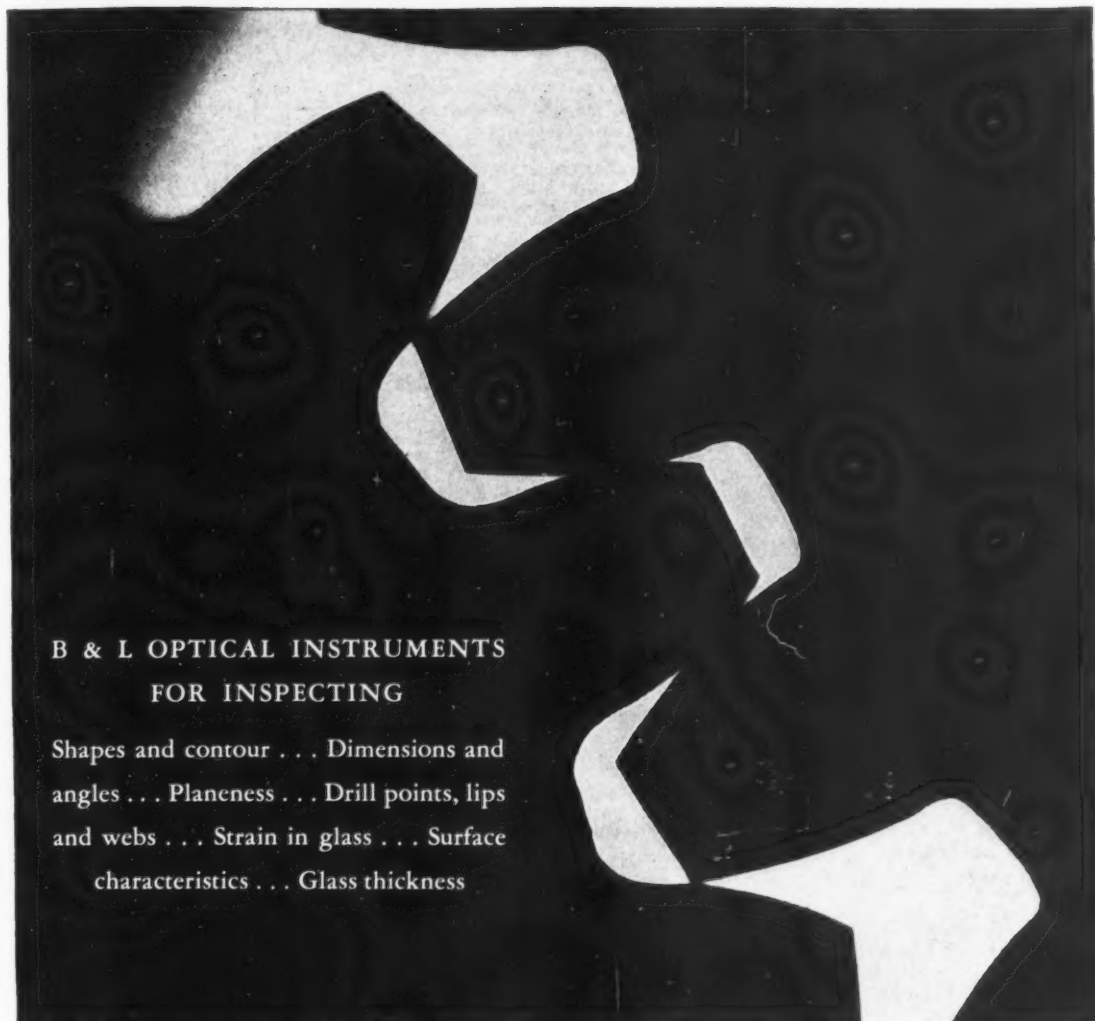


OILGEAR

Fluid Power

VARIABLE SPEED TRANSMISSIONS

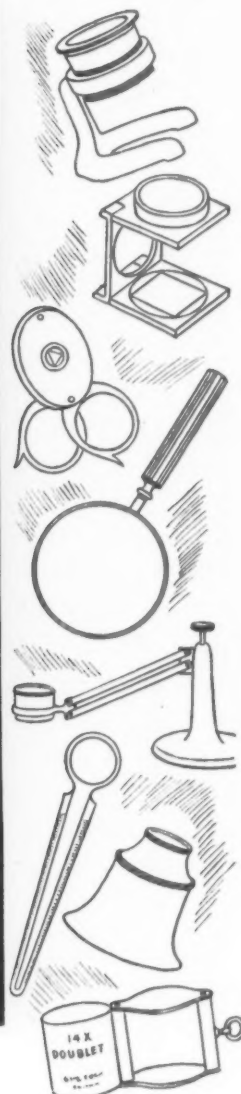
GEARED TO INDUSTRY



B & L OPTICAL INSTRUMENTS FOR INSPECTING

Shapes and contour . . . Dimensions and angles . . . Planeness . . . Drill points, lips and webs . . . Strain in glass . . . Surface characteristics . . . Glass thickness

This illustration made on B & L Contour Projector—an important inspection device for gears and irregularly shaped parts.



THE unusually favorable cooperation Bausch & Lomb Optical Co., has enjoyed with Industry and Science since its founding in 1853 has resulted in the development of an extremely large number of optical aids.

By multiplying eyesight, from two to many hundred times, optical aids permit a closeness of inspection that would be an epoch making achievement were it not so commonplace. From raw material to finished product, optical aids detect flaws, check tolerances, perform dozens of useful tasks.

For example, there are more than 25 separate B & L Magnifiers for simple and routine inspections. Convenience, high optical quality and sturdy mountings make such magnifiers a shop necessity. Our special Catalog I-15 will help you select the models best suited for your work. Send Coupon.

Note to Machine Builders

Bausch & Lomb Optical aids can frequently be built in as a permanent part of your machine. We will gladly cooperate with your designers.

Bausch & Lomb

BAUSCH & LOMB OPTICAL CO.
619 ST. PAUL STREET, ROCHESTER, N. Y.
Please send me Catalog No. I-15 on B & L Magnifiers.
NAME _____
COMPANY _____
ADDRESS _____
TITLE _____

WE MAKE OUR OWN GLASS TO
INSURE STANDARDIZED PRODUCTION



FOR YOUR GLASSES, INSIST ON B & L
ORTHOGON LENSES AND B & L FRAMES

CUTTING-OFF MACHINES

Brown & Sharpe Mfg. Co., Providence.
Landis Mch. Co., Inc., Waynesboro, Pa.
Scherr, Geo. Co., 128 Lafayette St.,
New York City.

CUTTING-OFF TOOLS

Armstrong Brothers Tool Co., 313 N.
Francisco Ave., Chicago.
Haynes Stellite Co., Kokomo, Ind.
Pratt & Whitney Co., Hartford, Conn.
Ready Tool Co., Bridgeport, Conn.
Williams, J. H. & Co., 75 Spring St.,
New York City.

CYLINDER BORING MACHINES

Baker Brothers, Inc., Toledo, O.
Barnes Drill Co., 814 Chestnut St.,
Rockford, Ill.
Consolidated Mch. Tool Corp. of Amer-
ica, Rochester, N. Y.
Ingersoll Milling Mch. Co., Rockford, Ill.

DEALERS, MACHINERY

Cincinnati Machinery & Supply Co.,
Cincinnati.
Earle Gear & Mch. Co., 4709 Stenton
Ave., Philadelphia.

Eastern Machinery Co., Cincinnati, O.
Miles Machinery Co., Saginaw, Mich.
Ryerson, Joseph T., & Son, Inc., 2558
West 16th St., Chicago, Ill.

DEMAGNETIZERS

Heald Machine Co., Worcester, Mass.
Walker, O. S., Co., Inc., Worcester,
Mass.

DESIGNERS, MACHINE AND TOOL

Hartford Special Machinery Co., Hart-
ford, Conn.
Manufacturers' Consulting Engineers,
Syracuse, N. Y.
Ruthman Machinery Co., 534-536 E.
Front St., Cincinnati, O.

DIAMONDS AND DIAMOND TOOLS

Bausch & Lomb Optical Co., 619 St.
Paul St., Rochester, New York.
Desmond-Stephan Mfg. Co., Urbana, O.
Diamond Tool Co., Pittsburgh, Pa.

DIE CASTING MACHINES

Kux-Lohner Machine Co., 2145-47 Lex-
ington St., Chicago.
Madison-Kipp Corp., Madison, Wis.
Reed-Prentice Corp., Worcester, Mass.

DIE CASTINGS

See Castings, Die or Pneumatic Mold.

DIE CUSHIONS, PNEUMATIC AND HYDRO-PNEUMATIC

Marquette Tool & Mfg. Co., Toledo, O.

DIE MAKERS' SUPPLIES

Baumbach, E. A., Mfg. Co., 1810 S.
Kilbourn Ave., Chicago.
U. S. Tool Co., Inc., Ampere, N. J.

DIE MAKING MACHINES

Oliver Instrument Co., 1410 E. Mau-
mee St., Adrian, Mich.

DIE SETS, STANDARD

Baumbach, E. A., Mfg. Co., 1810 S.
Kilbourn Ave., Chicago.
U. S. Tool Co., Inc., Ampere, N. J.

DIE SINKING MACHINES

Cincinnati Milling Mch. Co., Cincinnati.
Gorton, Geo., Machine Co., 1109 13th
St., Racine, Wis.
Pratt & Whitney Co., Hartford, Conn.
Reed-Prentice Corp., Worcester, Mass.

DIE STOCKS

See Stocks, Die.

DIES, SHEET METAL, ETC.

Baumbach, E. A., Mfg. Co., 1810 S.
Kilbourn Ave., Chicago.
Bliss, E. W., Co., Toledo, O.
Columbus Die Tool & Machine Co.,
Columbus, O.
Haynes Stellite Co., Kokomo, Ind.
Modern Machine Corp., 285 N. 6th St.,
Brooklyn, N. Y.
Niagara Mch. & Tool Works, Buffalo,
N. Y.
Ruthman Machinery Co., 534-536 E.
Front St., Cincinnati, O.
Taylor-Shantz, Inc., Rochester, N. Y.
U. S. Tool Co., Inc., Ampere, N. J.
V & O Press Co., Hudson, N. Y.
Waltham Mch. Wks., Waltham, Mass.

DIES, THREADING

Card, S. W., Mfg. Co., Mansfield, Mass.
Eastern Machine Screw Corp., New
Haven, Conn.
Geometric Tool Co., New Haven, Conn.
Greenfield Tap & Die Corp., Greenfield,
Mass.

H & G Works, Eastern Machine Screw
Corp., New Haven, Conn.
Hardinge Brothers, Inc., Elmira, N. Y.
Jones & Lamson Machine Co., Spring-
field, Vt.
Landis Mch. Co., Waynesboro, Pa.
Morse Twist Drill & Machine Co., New
Bedford, Mass.
Murphy Mch. & Tool Co., 951 Porter
St., Detroit, Mich.
National Acme Co., Cleveland, O.
Pratt & Whitney Co., Hartford, Conn.
Standard Tool Co., Cleveland, O.

DIES, THREADING, OPENING

Consolidated Mch. Tool Corp. of Amer-
ica, Rochester, N. Y.
Eastern Mch. Screw Corp., New Haven,
Conn.
Errington Mechanical Laboratory, 200
Broadway, New York.
Geometric Tool Co., New Haven, Conn.
H & G Works, Eastern Machine Screw
Corp., New Haven, Conn.
Jones & Lamson Machine Co., Spring-
field, Vt.
Landis Mch. Co., Inc., Waynesboro, Pa.
Murphy Mch. & Tool Co., 951 Porter
St., Detroit, Mich.
National Acme Co., Cleveland, O.

DIES, THREAD ROLLING

Hanson-Whitney Machine Co., Hartford,
Conn.
DISCS, ABRASIVE
Carborundum Co., Niagara Falls, N. Y.
Gardner Machine Co., 414 E. Gardner
St., Beloit, Wis.
Hanchett Mfg. Co., Big Rapids, Mich.
Manhattan Rubber Mfg. Div. Raybestos-
Manhattan, Inc., Passaic, N. J.
Norton Co., Worcester, Mass.
Walls Sales Corp., 96 Warren St.,
New York, N. Y.

DOWEL PINS

Baumbach, E. A., Mfg. Co., 1810 S.
Kilbourn Ave., Chicago.

DRAFTING MACHINES

Pease, C. F., Co., 822 No. Franklin
St., Chicago.

DRAWING BOARDS AND TABLES

Hamilton Mfg. Co., Two Rivers, Wis.
Pease, C. F., Co., 822 No. Franklin
St., Chicago.

DRAWING INSTRUMENTS AND MATERIALS

Pease, C. F., Co., 822 No. Franklin
St., Chicago.

DRESSERS, GRINDING WHEEL

Abrasive Co., Bridesburg, Philadelphia,
Pa.
Carboloy Co., Inc., Detroit, Mich.
Desmond-Stephan Mfg. Co., Urbana, O.
Manhattan Rubber Mfg. Div. Raybestos-
Manhattan, Inc., Passaic, N. J.
Norton Co., Worcester, Mass.
Standard Tool Co., Cleveland, O.

DRIFTS, DRILL

Armstrong Brothers Tool Co., 313 N.
Francisco Ave., Chicago.

DRILL HEADS, MULTIPLE

Baker Brothers, Inc., Toledo, O.
Barnes Drill Co., 814 Chestnut St.,
Rockford, Ill.
Buhr Machine Tool Co., Ann Arbor,
Mich.
Errington Mechanical Laboratory, 200
Broadway, New York.
Langellier Mfg. Co., Providence, R. I.
National Automatic Tool Co., Rich-
mond, Ind.
Rockford Drilling Mch. Co., Rockford,
Ill.

DRILL SOCKETS

Armstrong Brothers Tool Co., 313 N.
Francisco Ave., Chicago.
Cleveland Twist Drill Co., Cleveland, O.
Greenfield Tap & Die Corp., Greenfield,
Mass.
Morse Twist Drill & Machine Co., New
Bedford, Mass.
National Twist Drill & Tool Co.,
Detroit, Mich.
Standard Tool Co., Cleveland, O.
Union Twist Drill Co., Athol, Mass.

DRILL SPEEDERS

Graham Mfg. Co., Providence, R. I.

CLEEREMAN

DRILLING MACHINES

SLIDING HEAD or
STATIONARY

ROUND or
SQUARE COLUMNS

FULLY GEARED

ANTI FRICTION

AUTOMATIC OILING

SINGLE LEVER
CONTROL FOR FEED

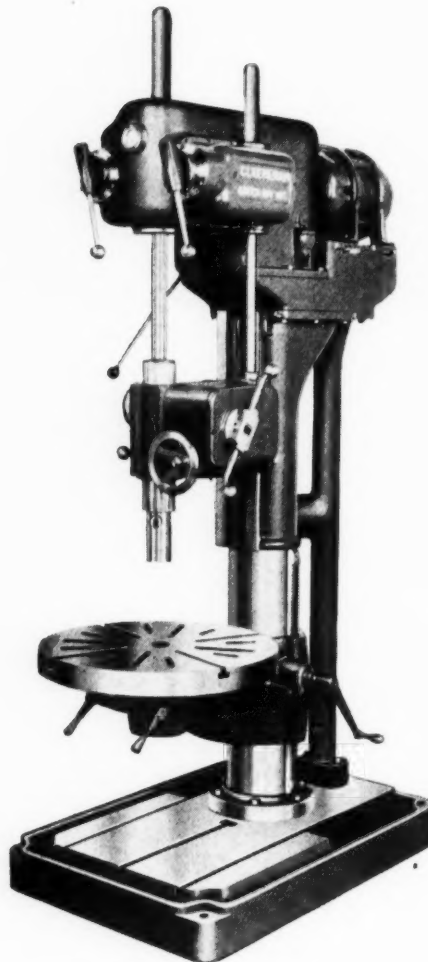
SINGLE LEVER
CONTROL FOR SPEEDS

REVERSING MOTOR —
NO CLUTCHES

The Outgrowth of More
Than 20 Years Experi-
ence in Building Drilling
Machinery.

Write for
Bulletins 101 and 102

THE CLEEREMAN MACHINE TOOL CO.
GREEN BAY, WIS.



Out of This We Made This



RECUT WITHOUT ANNEALING or altering the original temper. Spirals, side mills, plain mills, end mills, metal saws and high speed hack saw blades, made as good as new. Send a trial order and let us demonstrate.

We recut old files as good as new

CHICAGO TOOL RECLAIMING COMPANY
162 West Austin Avenue CHICAGO, ILL., U. S. A.

Famous for quality of threads they produce, long life of chasers and all-around dependability.

Following literature available:

Bulletin on H & G General Purpose Die Heads,
Bulletin on new Insert Chaser Type of Die Head,
Bulletin on H & G Threading Machines.
See our Advertisement, page 229, April Machinery

The Eastern Machine Screw Corp.

23-43 Barclay Street, New Haven, Conn.
Los Angeles: A. C. Behringer, 312 Commercial St.,
Los Angeles, Cal. San Francisco: A. H. Coates
Company, 1142 Howard St., San Francisco, Cal.



Die Heads

UNIVERSAL COLLET CHUCK

GRIPS AS STRONG
ASSOLIDSTEEL

CONCENTRIC
WITHIN .001

FOR
END
MILLS

UNIVERSAL ENGINEERING CO. FRANKENMUTH, MICH.

The Precision Universal Tool Head

A truly universal tool head that entirely displaces the old time wrench-adjusted offset boring head, as it not only bores but faces, undercuts, counterbores, recesses and turns outside diameters without a second's preparation or delay. All adjustments made without stopping tool or machine spindle, thus making routine work of difficult and unusual "headache" operations. One size handles all diameters up to 16". Super-accurate, rugged, compact. Unconditionally guaranteed. Send for bulletin.

THE PRECISION TOOL CO.
BRIDGEPORT, CONN.

ADJUSTABLE While Running!



NEW

Absolutely Different

DIEHEADS
SELF OPENING

TAPS
COLLAPSIBLE

THREAD SPECIALISTS

THE MURCHEY MACHINE & TOOL CO.
951 PORTER ST. DETROIT, MICH.

DO NOT LOSE THEIR TEMPER

Because—
RED-E CENTERS
have High Speed
Steel Points



HIGH SPEED CENTERS.

THE READY TOOL CO. 550 IRANISTAN AVE.
BRIDGEPORT, CONN.

ARMSTRONG



Even if you buy but a tool at a time you can build an Armstrong System of Tool Holders

Standard wherever metal is machined, used in over 96% of the machine shops and tool rooms, the Armstrong System of Tool Holders is still adaptable to both the greatest plants and the smallest shops. To enjoy the benefits of **ARMSTRONG TOOL HOLDERS**, (they "Save All Forging, 70% Grinding and 90% High Speed Steel") it is not necessary to "make-over" your plant or your men; you need not disrupt operation, discard present equipment or make a heavy investment in special tools and special cutters.

Permanent, multi-purpose tools each effectively equal to a complete set of forged tools, **ARMSTRONG TOOL HOLDERS** are provided for every operation on lathes, planers, slotters and shapers—for many operations on turret lathes and automatic screw machines. All embody the basic principle of an inserted cutter in a permanent shank or holder. All take cutters a y mechanic can quickly grind from standard shapes of high speed steel. All problems of correct cutting angle, maximum strength, rigidity and tool clearance have been fully worked out and are embodied in each tool holder.

Obtainable when and as needed from your nearest supply house they cut cutting-cost to a minimum, eliminate "tooling-up" time and assure from every working hour an hour's work accomplished and an hour's profit earned.

Write for Catalog B-35

ARMSTRONG BROS. TOOL CO.

"The Tool Holder People"

313 N. Francisco Ave.,

CHICAGO, U. S. A.

New York Office: 199 Lafayette St.
San Francisco London

ARMSTRONG

Tool Holders. Turret Lathe and Screw Machine Tools. "C" Clamps. Lathe and Milling Machine Dogs. Ratchet Drills. Setting-Up Tools. High Speed Steel. Carbide Cutters. Machine Shop Specialties

ARMSTRONG BROS.

Dies and Stocks, Receding Type Threaders, Pipe Cutters and Cutter Wheels, Pipe Vises, Pipe Wrenches and Chain Tongs.

DRILL STANDS

Cleveland Twist Drill Co., Cleveland, O.
Morse Twist Drill & Machine Co., New Bedford, Mass.
Standard Tool Co., Cleveland, O.
Union Twist Drill Co., Athol, Mass.

DRILLING MACHINES, AUTOMATIC

Baker Brothers, Inc., Toledo, O.
Barnes Drill Co., 814 Chestnut St., Rockford, Ill.
Barnes, W. F., & John Co., Rockford, Ill.
Buhr Machine Tool Co., Ann Arbor, Mich.
Grant Mfg. & Mch. Co., N. W. Station, Bridgeport, Conn.
Kingsbury Machine Tool Corp., Keene, N. H.
Langellier Mfg. Co., Providence, R. I.
National Automatic Tool Co., Richmond, Ind.

DRILLING MACHINES, BENCH

Ames, B. C. Co., Waltham, Mass.
Barnes, W. F., & John Co., Rockford, Ill.
Buffalo Forge Co., Buffalo, New York.
Delta Mfg. Co., Milwaukee, Wis.
Dumore Co., Racine, Wis.
High Speed Hammer Co., Inc., Rochester, N. Y.
Kingsbury Machine Tool Corp., Keene, N. H.
Langellier Mfg. Co., Providence, R. I.
LeBlond, R. K., Mch. Tool Co., Cincinnati, O.
Leland-Gifford Co., Worcester, Mass.
National Automatic Tool Co., Richmond, Ind.
Rockford Drilling Mch. Co., Rockford, Ill.

DRILLING MACHINES, BOILER

Foot-Burt Co., Cleveland, O.

DRILLING MACHINES, GANG

Baker Brothers, Inc., Toledo, O.
Barnes Drill Co., 814 Chestnut St., Rockford, Ill.
Barnes, W. F., & John Co., Rockford, Ill.
Foot-Burt Co., Cleveland, O.
Ingersoll Milling Mch. Co., Rockford, Ill.
Kingsbury Machine Tool Corp., Keene, N. H.
Langellier Mfg. Co., Providence, R. I.
Leland-Gifford Co., Worcester, Mass.
Moline Tool Co., Moline, Ill.
Rockford Drilling Mch. Co., Rockford, Ill.

DRILLING MACHINES, HORIZONTAL DUPLEX

Barnes, W. F., & John Co., Rockford, Ill.
Frew Machine Co., Philadelphia, Pa.
Kingsbury Machine Tool Corp., Keene, N. H.
Langellier Mfg. Co., Providence, R. I.
Murchey Mch. & Tool Co., 951 Porter St., Detroit, Mich.
Rockford Drilling Mch. Co., Rockford, Ill.
Sundstrand Machine Tool Co., Rockford, Ill.

DRILLING MACHINES, MULTIPLE SPINDLE

Baker Brothers, Inc., Toledo, O.
Barnes Drill Co., 814 Chestnut St., Rockford, Ill.
Barnes, W. F., & John Co., Rockford, Ill.
Buhr Machine Tool Co., Ann Arbor, Mich.
Consolidated Machine Tool Corporation, Rochester, N. Y.
Foot-Burt Co., Cleveland, O.
Greenlee Bros. & Co., Rockford, Ill.
Ingersoll Milling Mch. Co., Rockford, Ill.
Kingsbury Machine Tool Corp., Keene, N. H.
Langellier Mfg. Co., Providence, R. I.
Leland-Gifford Co., Worcester, Mass.
Moline Tool Co., Moline, Ill.
National Automatic Tool Co., Richmond, Ind.
Pratt & Whitney Co., Hartford, Conn.
Rockford Drilling Mch. Co., Rockford, Ill.

DRILLING MACHINES, RADIAL

Carlton Machine Tool Co., Cincinnati.

DRILLING MACHINES, RAIL

See heading Drilling Machines, Gang.

DRILLING MACHINES, SENSITIVE

Barnes, W. F., & John Co., Rockford, Ill.
Foot-Burt Co., Cleveland, O.
Hardings Brothers, Inc., Elmira, N. Y.
High Speed Hammer Co., Inc., Rochester, N. Y.
Kingsbury Machine Tool Corp., Keene, N. H.
Langellier Mfg. Co., Providence, R. I.
Leiman Bros., Inc., Newark, N. J.
Leland-Gifford Co., Worcester, Mass.
Manufacturers' Consulting Engineers, Syracuse, N. Y.
Pratt & Whitney Co., Hartford, Conn.
Rockford Drilling Mch. Co., Rockford, Ill.
Ryerson, Joseph T., & Son, Inc., 2558 West 16th St., Chicago, Ill.

DRILLING MACHINES, UPRIGHT

Baker Brothers, Inc., Toledo, O.

Barnes Drill Co., 814 Chestnut St., Rockford, Ill.

Barnes, W. F., & John Co., Rockford, Ill.

Buffalo Forge Co., Buffalo, New York.
Cleereman Machine Tool Co., Green Bay, Wis.
Consolidated Machine Tool Corporation, Rochester, N. Y.
Delta Mfg. Co., Milwaukee, Wis.
Foot-Burt Co., Cleveland, O.
Ingersoll Milling Mch. Co., Rockford, Ill.
Kingsbury Machine Tool Corp., Keene, N. H.
Langellier Mfg. Co., Providence, R. I.
Leland-Gifford Co., Worcester, Mass.
Rockford Drilling Mch. Co., Rockford, Ill.
Ryerson, Joseph T., & Son, Inc., 2558 West 16th St., Chicago, Ill.

DRILLING MACHINES, WALL RADIAL

Harnischfeger Corp., Milwaukee, Wis.

DRILLS, CENTER

Cleveland Twist Drill Co., Cleveland, O.
Greenfield Tap & Die Corp., Greenfield, Mass.
Morse Twist Drill & Machine Co., New Bedford, Mass.
National Twist Drill & Tool Co., Detroit, Mich.
Pratt & Whitney Co., Hartford, Conn.
Standard Tool Co., Cleveland, O.
Union Twist Drill Co., Athol, Mass.

DRILLS, CORE

Carboly Co., Inc., Detroit, Mich.
McCrosky Tool Corp., Meadville, Pa.
Morse Twist Drill & Machine Co., New Bedford, Mass.
Union Twist Drill Co., Athol, Mass.

DRILLS, PORTABLE ELECTRIC

Dumore Co., Racine, Wis.
Errington Mechanical Laboratory, 200 Broadway, New York.
Haskins, R. G., Co., 4634 Fulton St., Chicago.
Ryerson, Joseph T., & Son, Inc., 2558 West 16th St., Chicago, Ill.
White, S. S. Dental Mfg. Co., 10 East 40th St., New York.

DRILLS, RATCHET

Armstrong Brothers Tool Co., 313 N. Francisco Ave., Chicago.
Cleveland Twist Drill Co., Cleveland, O.
Greene, Tweed & Co., 109 Duane St., New York City.
Greenfield Tap & Die Corp., Greenfield, Mass.
Morse Twist Drill & Machine Co., New Bedford, Mass.
National Twist Drill & Tool Co., Detroit, Mich.
Pratt & Whitney Co., Hartford, Conn.
Standard Tool Co., Cleveland, O.
Union Twist Drill Co., Athol, Mass.

DRILLS, SQUARE AND HEXAGON

Watta Bros. Tool Wks., Wilmerding, Pa.

DRILLS, TWIST

Carboly Co., Inc., Detroit, Mich.
Cleveland Twist Drill Co., Cleveland, O.
Colton, Arthur, Co., 2618 Jefferson Ave., E. Detroit, Mich.
Greenfield Tap & Die Corp., Greenfield, Mass.

DRILLS, WIRE

Union Twist Drill Co., Athol, Mass.

DRIVE SCREWS, SELF-TAPPING

Parker-Kalon Corp., 200 Varick St., New York.

ELECTRICAL EQUIPMENT

General Electric Co., Schenectady, N. Y.

ELEVATORS, MATERIAL HANDLING

Link-Belt Co., Chicago.

EMERY WHEELS

See Grinding Wheels.

EMERY WHEEL DRESSERS

See Dressers, Grinding Wheel.

ENGINEERS, CONSULTING MECHANICAL

Manufacturers' Consulting Engineers, Syracuse, N. Y.

ENGRAVING MACHINES

Gorton, Geo., Mch. Co., 1109 13th St., Racine, Wis.
Pratt & Whitney Co., Hartford, Conn.

FANS, EXHAUST, ELECTRIC VENTILATING

Buffalo Forge Co., Buffalo, New York.
General Electric Co., Schenectady, N. Y.

FEEDS FOR PUNCH PRESSES, AUTOMATIC

Littell, F. J., Mch. Co., 4125 Ravenswood Ave., Chicago.

FELT PRODUCTS

Felters Co., Boston, Mass.

FERRO ALLOYS

New Jersey Zinc Co., 160 Front St., New York City.

Vanadium Alloys Steel Co., Latrobe, Pa.

FILES

Chicago Tool Reclaiming Co., 147 W. Austin Ave., Chicago.
Diaston, Henry, & Sons, Inc., Philadelphia, Pa.
Nicholson File Co., Providence, R. I.

FILES, ROTARY

Strand, N. A., & Co., 5001 N. Lincoln St., Chicago.

FILING MACHINES, DIE, ETC.

Ames, B. C. Co., Waltham, Mass.
Haskins, R. G., Co., 4634 Fulton St., Chicago.
Illinois Tool Works, 2501 North Keeler Ave., Chicago, Ill.

Oliver Instrument Co., 1410 E. Maumee St., Adrian, Mich.

FLEXIBLE COUPLINGS

Link-Belt Co., Chicago.

FLEXIBLE SHAFT EQUIPMENT

Dumore Co., Racine, Wis.
Errington Mechanical Laboratory, 200 Broadway, New York.
Haskins, R. G., Co., 4634 Fulton St., Chicago.
Oliver Instrument Co., 1410 E. Maumee St., Adrian, Mich.
Strand, N. A., & Co., 5001 N. Lincoln St., Chicago.

White, S. S. Dental Mfg. Co., 10 East 40th St., New York.

FORGES

American Gas Furnace Co., Elizabeth, N. J.
Buffalo Forge Co., Buffalo, New York.

FORGING MACHINES

Acme Mfg. Co., Cleveland, O.
Bliss, E. W. Co., Toledo, O.
Greenfield Tap & Die Corp., Greenfield, Mass.

FORGINGS, DROP

Williams, J. H., & Co., 75 Spring St., New York City.

FORGINGS, IRON AND STEEL

Morgan Engineering Co., Alliance, O.

FORGINGS, UPSET

Bearings Co. of America, Lancaster, Pa.
Williams, J. H., & Co., 75 Spring St., New York City.

FORMING AND BENDING MACHINES

Niagara Machine & Tool Wks., Buffalo, N. Y.

FOUNDRY EQUIPMENT

Link-Belt Co., Chicago.
New Britain-Gridley Mch. Co., New Britain, Ct.

FURNACES, HARDNESS

Leeds & Northrup Co., Philadelphia, Pa.

FURNACES, HEAT-TREATING ELECTRIC

General Electric Co., Schenectady, N. Y.
Leeds & Northrup Co., Philadelphia, Pa.
Strong, Carlisle & Hammond Co., Cleveland.

FURNACES, HEAT-TREATING OIL, GAS, ETC.

American Gas Furnace Co., Elizabeth, N. J.
Strong, Carlisle & Hammond Co., Cleveland.

FURNITURE, DRAFTING-ROOM

Hamilton Mfg. Co., Two Rivers, Wis.
New Britain-Gridley Mch. Co., New Britain, Ct.

FURNITURE, SHOP

Hamilton Mfg. Co., Two Rivers, Wis.
New Britain-Gridley Mch. Co., New Britain, Ct.

GAGE STANDARDS

Ford Motor Co. (Johansson Div.), Detroit, Mich.
Pratt & Whitney Co., Hartford, Conn.

GAGES, COMPARATOR

Federal Products Corp., Providence.
Jones & Lamson Machine Co., Springfield, Vt.

Scherr, Geo. Co., 128 Lafayette St., New York City.

GAGES, DEPTH

Brown & Sharpe Mfg. Co., Providence.
Federal Products Corp., Providence.

Starrett, L. S., Co., Athol, Mass.
Taylor-Shantz, Inc., Rochester, N. Y.

GAGES, DIAL

Ames, B. C. Co., Waltham, Mass.
Brown & Sharpe Mfg. Co., Providence.
Federal Products Corp., Providence.

Scherr, Geo. Co., 128 Lafayette St., New York City.

GAGES, HEIGHT

Brown & Sharpe Mfg. Co., Providence.
Starrett, L. S., Co., Athol, Mass.

GAGES, PLUG, RING AND SNAP

Brown & Sharpe Mfg. Co., Providence.
Cleveland Twist Drill Co., Cleveland, O.
Ex-Cell-O Aircraft & Tool Corp., Detroit, Mich.
Federal Products Corp., Providence.
Ford Motor Co. (Johansson Div.), Detroit, Mich.

Greenfield Tap & Die Corp., Greenfield, Mass.

Haynes Stellite Co., Kokomo, Ind.
Morse Twist Drill & Machine Co., New Bedford, Mass.

Pratt & Whitney Co., Hartford, Conn.

Starrett, L. S., Co., Athol, Mass.
Taylor-Shantz, Inc., Rochester, N. Y.

GAGES, SURFACE

Brown & Sharpe Mfg. Co., Providence.
Columbus Die, Tool & Machine Co., Columbus, O.

Starrett, L. S., Co., Athol, Mass.
Taylor-Shantz, Inc., Rochester, N. Y.

GAGES, TAPER

Ford Motor Co. (Johansson Div.), Detroit, Mich.

Pratt & Whitney Co., Hartford, Conn.
Starrett, L. S., Co., Athol, Mass.

GAGES, THREAD

Bath, John, & Co., Inc., Worcester, Mass.

Brown & Sharpe Mfg. Co., Providence.
Federal Products Corp., Providence.

Greenfield Tap & Die Corp., Greenfield, Mass.
Hanson-Whitney Machine Co., Hartford, Conn.

Jones & Lamson Machine Co., Springfield, Vt.

Pratt & Whitney Co., Hartford, Conn.
Starrett, L. S., Co., Athol, Mass.

GASKETS

Garlock Packing Co., Palmyra, N. Y.
Greene, Tweed & Co., 109 Duane St., New York City.

Manhattan Rubber Mfg. Div. Raybestos-Manhattan, Inc., Passaic, N. J.

GEAR BLANKS, NON-METALLIC

Ganschow, Wm., Co., Chicago.

GEAR CHECKING MACHINES

Michigan Tool Co., Detroit, Mich.

GEAR CUTTING MACHINES, BEVEL (GENERATOR AND TEMPLET PLANNER)

Bilgram Gear & Machine Works, 1217-35 Spring Garden St., Philadelphia.

GEAR CUTTING MACHINES, BEVEL AND SPUR (ROTARY CUTTER)

Brown & Sharpe Mfg. Co., Providence.
Waltham Mch. Wks., Waltham, Mass.

GEAR CUTTING MACHINES, HELICAL AND SPUR (HOB)

Barber-Colman Co., Rockford, Ill.
Brown & Sharpe Mfg. Co., Providence.
Scherr, Geo. Co., 128 Lafayette St., New York City.

GEAR CUTTING MACHINES, HELICAL AND SPUR (SHAPER OR PLANNER TYPE)

Fellows Gear Shaper Co., Springfield, Vt.

GEAR CUTTING MACHINES, WORMS AND WORM WHEELS (HOB)

Barber-Colman Co., Rockford, Ill.

GEAR TESTING MACHINERY

Brown & Sharpe Mfg. Co., Providence.
Illinois Tool Works, 2501 North Keeler Ave., Chicago, Ill.

Manufacturers' Consulting Engineers, Syracuse, N. Y.

Morse Twist Drill & Machine Co., New Bedford, Mass.

Scherr, Geo. Co., 128 Lafayette St., New York City.

GEARS, CUT

Bilgram Gear & Machine Works, 1217-35 Spring Garden St., Philadelphia.

Boston Gear Works, Inc., North Quincy, Mass.

Brown & Sharpe Mfg. Co., Providence.
Crofoot, Chas. E., Gear Corp., So. Easton, Mass.

Cullman Wheel Co., 1339 Altgeld St., Chicago, Ill.

Dieffendorf Gear Corp., Syracuse, N. Y.

Earle Gear & Mch. Co., 4709 Stenton Ave., Philadelphia.

Fellows Gear Shaper Co., Springfield Vt.

Ganschow, Wm., Co., Chicago.

General Electric Co., Schenectady, N. Y.

Grant Gear Works, Inc., Boston, Mass.
Hartford Special Mch. Co., Hartford, Conn.

Link-Belt Co., Chicago.

Massachusetts Gear & Tool Co., 34 Nashua St., Woburn, Mass.

Michigan Tool Co., Detroit, Mich.

Perkins Machine & Gear Co., Springfield, Mass.

Philadelphia Gear Works, Philadelphia.

Poole Fdry. & Mch. Co., Baltimore, Md.

IT'S A PLEASURE TO MEASURE WITH JOHANSSON GAGE BLOCKS AND ACCESSORIES

• Johansson Gage Blocks and Jaws in an Adjustable Holder form an extremely accurate measuring instrument and can be quickly assembled. There are additional Johansson Accessories which increase the usefulness of Johansson Gages in toolroom work. They help increase accuracy and save time. May we send you the latest Johansson Catalog?



JOHANSSON GAGE BLOCKS AND ACCESSORIES

Manufactured, sold and serviced in the United States and Canada by

FORD MOTOR COMPANY
Johansson Division Dearborn, Michigan

HARDNESS TESTING



For a fast Non-destructive test and 100% Portability—the latest improved SCLEROSCOPE (International Standard). Used the world over. Exact conversions to Brinell now available.

For a Static Test determining Qualitative and Quantitative hardness in all, including Super-hard Materials—the MONOTRON. Best for Sub-surface and Non-destructive Testing. Fastest Testing Machine now on the market and in wide use.

Descriptive Bulletins Free on Application

**The Shore Instrument
& Manufacturing Co.**
9025 Van Wyck Ave.
JAMAICA, N. Y.

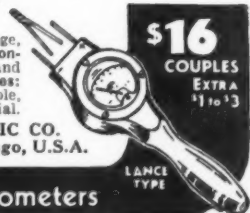
Every Shop Needs These Rugged, Accurate, Portable Pyrometers

L88 for checking Surface Temperatures: 800° range, with 1 ft. silver tip couple, \$17.90. L89 for Non-ferrous Metals: 1600° range, with 2 ft. couple and 1 ft. replaceable tip, \$19.30. L90 for furnaces: 2500° range, with 3 ft. couple, \$19.00. Sent on 30-Day Trial.

Circular Free



Hold-Heat Pyrometers



\$16
COUPLES
EXTRA
\$1 to \$3

RUSSELL ELECTRIC CO.
354 W. Huron St., Chicago, U.S.A.

Alnor PYROMETERS

ACCURATE, SENSITIVE, DURABLE
PORTABLE AND WALL TYPES
Thousands In Use

For every temperature service.

WRITE FOR CATALOG

ILLINOIS TESTING LABORATORIES, Inc.
429 N. La Salle St. CHICAGO, ILLINOIS



A New Gauge



Send for Catalog 51

AMES Shockless Gauge

B. C. AMES CO.

Waltham, Massachusetts

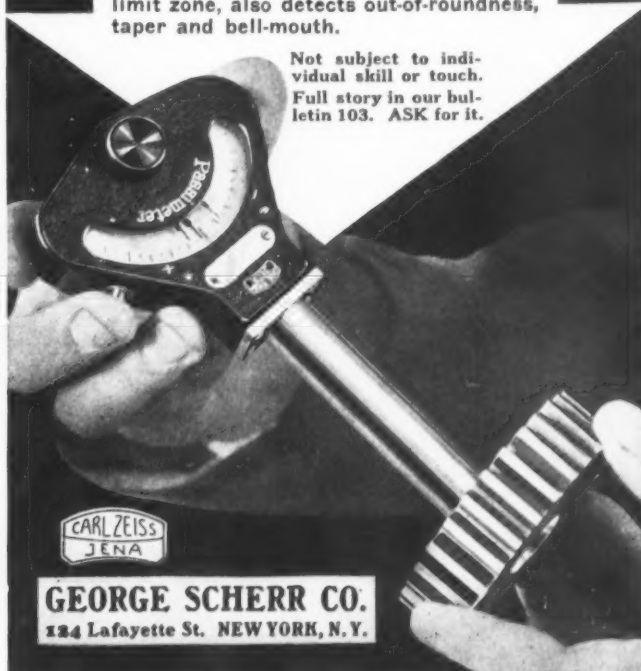
453

A Single ZEISS PASSIMETER

Replaces a Whole Set of Plug Gauges

QUICKLY SET TO SIZE AND ANY PLUS OR MINUS TOLERANCE, a single Zeiss Passimeter replaces a whole set of ordinary "Go" and "No-go" plug gauges, simply by exchanging the measuring head. The Indicator tells accurately how far the work is from the limit zone, also detects out-of-roundness, taper and bell-mouth.

Not subject to individual skill or touch.
Full story in our bulletin 103. ASK for it.



**CARL ZEISS
JENA**

GEORGE SCHERR CO.
124 Lafayette St. NEW YORK, N. Y.

GEARS, MOLDED

Link-Belt Co., Chicago.
Philadelphia Gear Works, Philadelphia.
Poole Fdry. & Mch. Co., Baltimore, Md.
Stahl Gear & Machine Co., Cleveland.
Wood's, T. B., Sons, Co., Chambersburg, Pa.

GEARS, RAWHIDE AND NON-METALLIC

Boston Gear Works, Inc., North Quincy, Mass.
Diefendorf Gear Corp., Syracuse, N. Y.
Earle Gear & Mch. Co., 4709 Stenton Ave., Philadelphia.
Ganschow, Wm., Co., Chicago.
General Electric Co., Schenectady, N. Y.
Grant Gear Works, Inc., Boston, Mass.
Hartford Special Mch. Co., Hartford, Conn.
James, D. O. Mfg. Co., 1120 W. Monroe St., Chicago.
Massachusetts Gear & Tool Co., 34 Nashua St., Woburn, Mass.
Philadelphia Gear Works, Philadelphia.
Stahl Gear & Machine Co., Cleveland.
GENERATORS, ELECTRIC
Fairbanks-Morse & Co., 9th & Wabash Ave., Chicago.
General Electric Co., Schenectady, N. Y.
Lincoln Electric Co., Cleveland.

GRADUATING MACHINES

Gorton, Geo., Mch. Co., 1109 13th St., Racine, Wis.

GREASE

Houghton, E. F., & Co., Philadelphia, Pa.
Sun Oil Co., Philadelphia.

GREASE CUPS

Link-Belt Co., Chicago.

GRINDERS, DIE AND MOLD

Haskins, R. G., Co., 4634 Fulton St., Chicago.
White, S. S., Dental Mfg. Co., 10 East 40th St., New York, N. Y.

GRINDERS, PORTABLE ELECTRIC

Dumore Co., Racine, Wis.
Haskins, R. G., Co., 4634 Fulton St., Chicago.
McGonigal Mfg. Co., E. Rutherford, N. J.
White, S. S., Dental Mfg. Co., 10 East 40th St., New York, N. Y.

GRINDERS, PNEUMATIC

Madi-on-Kipp Corp., Madison, Wis.

GRINDING MACHINES, ABRASIVE, BELT

Porter-Cable Machine Co., Salina, and Wolf Streets, Syracuse, N. Y.

Production Mch. Co., Greenfield, Mass.
Walls Sales Corp., 96 Warren St., New York, N. Y.

GRINDING MACHINES, BENCH

Atlas Press Co., Kalamazoo, Mich.
Diamond Machine Co., Providence, R. I.
Hardinge Brothers, Inc., Elmira, N. Y.
New Britain-Gridley Mch. Co., New Britain, Ct.
Rivett Lathe & Grinder Inc., Brighton, Boston, Mass.
Ryerson, Joseph T., & Son, Inc., 2558 West 16th St., Chicago, Ill.
Walker, O. S., Co., Inc., Worcester, Mass.

GRINDING MACHINES, CAMSHAFT

Landis Tool Co., Waynesboro, Pa.
Norton Co., Worcester, Mass.

GRINDING MACHINES, CEMENTED CARBIDE TOOL

Ex-Cell-O Aircraft & Tool Corp., Detroit.
Prosser, Thomas, & Son, 15 Gold St., New York, N. Y.
Stokerunit Corp., Milwaukee, Wis.

GRINDING MACHINES, CENTERLESS

Cincinnati Grinders Inc., Cincinnati.

GRINDING MACHINES, CHASER OR DIE

Eastern Machine Screw Corp., New Haven, Conn.
Geometric Tool Co., New Haven, Conn.
H & G Works, Eastern Machine Screw Corp., New Haven, Conn.
Landis Tool Co., Waynesboro, Pa.

GRINDING MACHINES, CHUCKING

Bryant Chucking Grinder Co., Springfield, Vt.

GRINDING MACHINES, CONTOUR

Baker Brothers, Inc., Toledo, O.

GRINDING MACHINES, CRANKSHAFT

Cincinnati Grinders Inc., Cincinnati.
Landis Tool Co., Waynesboro, Pa.
Norton Co., Worcester, Mass.

GRINDING MACHINES, CUTTER

See Grinding Machines, Tool & Cutter

GRINDING MACHINES, CYLINDER

Heald Machine Co., Worcester, Mass.
Landis Tool Co., Waynesboro, Pa.

GRINDING MACHINES, CYLINDERICAL, PLAIN AND UNIVERSAL

Brown & Sharpe Mfg. Co., Providence.
Cincinnati Grinders Inc., Cincinnati.
Landis Tool Co., Waynesboro, Pa.
Modern Tool Works (Consolidated Mch. Tool Corp.), Rochester, N. Y.
Morse Twist Drill & Machine Co., New Bedford, Mass.

GRINDING MACHINES, DISC

Diamond Machine Co., Providence, R. I.
Gardner Machine Co., 414 E. Gardner St., Beloit, Wis.
Hanchett Mfg. Co., Big Rapids, Mich.
Porter-Cable Machine Co., Salina and Wolf Streets, Syracuse, N. Y.
Rowbottom Machine Co., Waterbury, Conn.

GRINDING MACHINES, DRILL

Atlas Press Co., Kalamazoo, Mich.
Gallmeyer & Livingston Co., Grand Rapids, Mich.
Morse Twist Drill & Machine Co., New Bedford, Mass.
Oliver Instrument Co., 1410 E. Maurice St., Adrian, Mich.
Union Twist Drill Co., Athol, Mass.

GRINDING MACHINES, FACE

Abrasive Machine Tool Co., East Providence, R. I.
Diamond Machine Co., Providence, R. I.
Hanchett Mfg. Co., Big Rapids, Mich.

GRINDING MACHINES, FLEXIBLE SHAFT

See Flexible Shaft Equipment.

GRINDING MACHINES, FLOOR STAND TYPE

Diamond Machine Co., Providence, R. I.

GRINDING MACHINES, HOB

Barber-Colman Co., Rockford, Ill.
Scherr, Geo. Co., 128 Lafayette St., New York City.
Union Twist Drill Co., Athol, Mass.

GRINDING MACHINES, INTERNAL

Bryant Chucking Grinder Co., Springfield, Vt.
Greenfield Tap & Die Corp., Greenfield, Mass.

GRINDING MACHINES, KNIFE AND SHEAR BLADE

Diamond Machine Co., Providence, R. I.
Hanchett Mfg. Co., Big Rapids, Mich.

GRINDING MACHINES, PATTERNMAKER'S DISC

Gardner Machine Co., 414 E. Gardner St., Beloit, Wis.

GRINDING MACHINES, PISTON RING

Heald Machine Co., Worcester, Mass.

GRINDING MACHINES, PORTABLE ELECTRIC AND TOOLPOST

See under Grinders, Portable Electric.

GRINDING MACHINES, PULLEY

Abrasive Machine Tool Co., East Providence, R. I.
Diamond Machine Co., Providence, R. I.
Hanchett Mfg. Co., Big Rapids, Mich.

GRINDING MACHINES, RADIAL, BALL RACE, ETC.

Landis Tool Co., Waynesboro, Pa.
Van Norman Mch. Tool Co., Springfield, Mass.

GRINDING MACHINES, RADIUS, LINK

Sundstrand Machine Tool Co., Rockford, Ill.

GRINDING MACHINES, RING WHEEL

Diamond Machine Co., Providence, R. I.
Gardner Machine Co., 414 E. Gardner St., Beloit, Wis.

GRINDING MACHINES, RING WHEEL

Graham Mfg. Co., Providence, R. I.
Hanchett Mfg. Co., Big Rapids, Mich.

Puts *New Life* INTO LAZY CLEANING TANKS

Are your cleaning tanks lazy, sluggish . . . slow to act on oils, greases, cutting, stamping or buffing compounds? Do they do only a half job . . . requiring time-consuming, expensive brushing or wiping to finish up the cleaning?

You can put NEW life . . . vigorous, energetic cleaning ACTION into your tanks with modern, money-saving Oakite materials. Cleaning is speeded up . . . unnecessary wiping and brushing are eliminated.

The different Oakite materials designed for tank cleaning combine long solution life, amazing cleaning speed, complete safety to product, equipment and workmen. Let us tell you more about them. Tell us your problem or write today for interesting booklets.

OAKITE PRODUCTS, INC.

GENERAL OFFICES

28 THAMES ST. NEW YORK

OAKITE

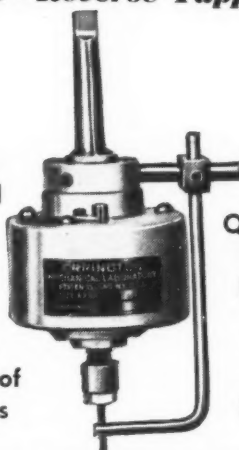
TRADE MARK REG. U.S. PAT. OFF.

SPECIALIZED INDUSTRIAL CLEANING MATERIALS & METHODS

ERRINGTON HY-SPD Super-Sensitive Ball Bearing CONE DRIVE 2 to 1 Auto - Reverse Tapping Chuck

Combination
Bronze & Ball
Bearings
Thru-Out

Easy and
Economical
Replacement of
Cone-Clutches



Depth-Gauge
facilitates
Quick-Handling,
Especially on
Bottom-Holes

Other Styles
and Sizes
0" to 2" Taps

Size	Taps in Steel	Taps in Cast Iron	Price	Code
No. 00	0" to 3/16"	to 1/4"	\$35.00	Phlam
No. 0	to 3/8"	to 1/2"	\$50.00	Phalanx

The principle on which this Style is designed is especially effective on very small tapping; whereas, in the No. 0 size the Frictional Grip is Greatly INTENSIFIED, to cover a wider range, without loss of sensitiveness.

Errington Mechanical Laboratory
Main Office and Works, STATEN ISLAND, New York
Chicago Office: 6047 N. Talman Ave. New York Office: 200 Broadway Boston Office: 830 Old South Bldg.

Pioneers in Ground Thread Chasers



Accuracy, ease of set-up, and low cost per acceptable thread make the line of J&L Dies outstanding. Stationary and Revolving types in Radial and Tangent models are available. Write for literature.



JONES & LAMSON MACHINE COMPANY
SPRINGFIELD, VERMONT

Columbia Improved Locknut



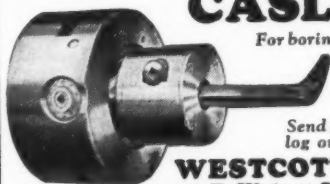
MAKERS OF
LOCK-NUTS, NUT-LOCKS

For Every Use Since 1900

Ask for Samples

Columbia Nut & Bolt Co., Inc.
Bridgeport, Conn.

CASLER OFFSET BORING HEADS



For boring and counterboring holes to size.

Reduce cost of jigs, fixtures and experimental work and save time and money in straight manufacturing.

Send for Free Catalog. Also ask for Catalog on Westcott Chucks. No obligation.

WESTCOTT CHUCK COMPANY
116 E. Walnut Street ONEIDA, N. Y.

WHAT A TAPPER!

"Our tapping difficulties stopped" says one plant superintendent, "when the new PROCUNIER Style E was put on the job."

The New

PROCUNIER

HIGH SPEED—SENSITIVE
TAPPING ATTACHMENT

EQUIPPED WITH THE

NEW "TRU-GRIP" TAP HOLDER



SMALLER

LIGHTER

MORE SENSITIVE

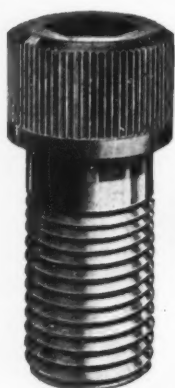
The new "TRU-GRIP" tap holder is solving many tapping problems every day. The newest development for high speed precision tapping. Send for your copy of entirely new literature.

PROCUNIER SAFETY CHUCK CO.

"PIONEERS OF SAFETY TAPPING"

16 So. Clinton St.,

CHICAGO, ILL.

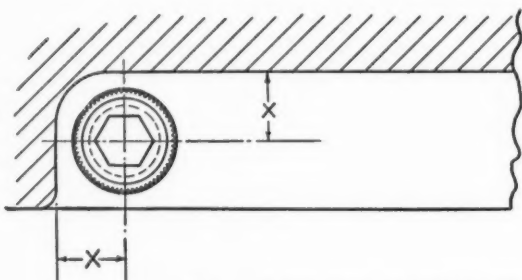


PATS. PENDING.
KNURLED "UNBRAKO"
SOCKET CAP

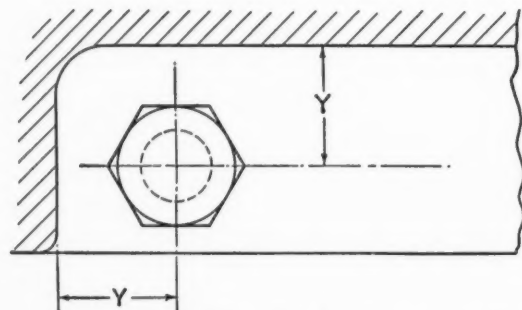
KNURLED

UNBRAKO

for
COMPACT
DESIGNS



See how the knurled "Unbrako"
snuggles right into the corner



Notice the great open spaces
necessary for the hex head and
wrench

The difference between "X" and "Y" in line cuts demonstrates the decided saving in Clearance, Material, Weight and Cost made possible by using the Knurled "Unbrako" Socket Head Cap Screw.

Don't pooh! pooh! these advantages as they may help to make difficult designs easier and much more compact.

The Knurled "Unbrako" is the only Socket Cap Screw with a Knurled head; furthermore, the only one that can be locked and that will save time in assembling.

Be sure to get our complete and interesting
"Unbrako" Bulletin No. 485.

STANDARD PRESSED STEEL CO.

BRANCHES
BOSTON
CHICAGO
DETROIT

JENKINTOWN, PENNA.

BOX 22

BRANCHES
NEW YORK
SAN FRANCISCO
ST. LOUIS

GRINDING MACHINES, ROLL
Cincinnati Grinders, Inc., Cincinnati.
Landis Tool Co., Waynesboro, Pa.
Norton Co., Worcester, Mass.

GRINDING MACHINES, SURFACE
Abrasive Machine Tool Co., East Providence, R. I.
Blanchard Machine Co., 64 State St., Cambridge, Mass.
Brown & Sharpe Mfg. Co., Providence.
Diamond Machine Co., Providence, R. I.
Gallmeyer & Livingston Co., Grand Rapids, Mich.
Gardner Machine Co., 414 E. Gardner St., Beloit, Wis.
Hanchett Mfg. Co., Big Rapids, Mich.
Heald Machine Co., Worcester, Mass.
Mattison Machine Works, Rockford, Ill.
Norton Co., Worcester, Mass.
Pratt & Whitney Co., Hartford, Conn.
Rowbottom Machine Co., Waterbury, Conn.
Walker, O. S. Co., Inc., Worcester, Mass.

GRINDING MACHINES, SWING FRAME
Diamond Machine Co., Providence, R. I.
Manhattan Rubber Mfg. Div. Raybestos-Manhattan, Inc., Passaic, N. J.

GRINDING MACHINES, TAP
Gallmeyer & Livingston Co., Grand Rapids, Mich.
Oliver Instrument Co., 1410 E. Maumee St., Adrian, Mich.

GRINDING MACHINES, TOOL AND CUTTER
Armstrong Brothers Tool Co., 313 N. Francisco Ave., Chicago.
Baird Machine Co., Bridgeport, Conn.
Barber-Colman Co., Rockford, Ill.
Brown & Sharpe Mfg. Co., Providence.
Cincinnati Grinders Inc., Cincinnati.
Davis Boring Tool Co., Inc., 6200 Maple Ave., St. Louis, Mo.
Diamond Machine Co., Providence, R. I.
Dumore Co., Racine, Wis.
Fafnir Bearing Co., New Britain, Conn.
Gallmeyer & Livingston Co., Grand Rapids, Mich.
Gisholt Machine Co., Madison, Wis.
Gorton, Geo., Mch. Co., 1109 13th St., Racine, Wis.
Ingersoll Milling Mch. Co., Rockford, Ill.
Landis Tool Co., Waynesboro, Pa.
LeBlond, R. K., Mch. Tool Co., Cincinnati, O.

Modern Tool Works (Consolidated Mch. Tool Corp.), Rochester, N. Y.
Morse Twist Drill & Machine Co., New Bedford, Mass.
Mummert-Dixon Co., Hanover, Pa.
Norton Co., Worcester, Mass.
Oliver Instrument Co., 1410 E. Maumee St., Adrian, Mich.
Pratt & Whitney Co., Hartford, Conn.
Sundstrand Machine Tool Co., Rockford, Ill.
Union Twist Drill Co., Athol, Mass.
Walker, O. S. Co., Inc., Worcester, Mass.
Waltham Mch. Wks., Waltham, Mass.

GRINDING MACHINES, UNIVERSAL LATHE AND PLANNER TOOL
Gisholt Machine Co., Madison, Wis.

GRINDING WHEELS
Abrasive Co., Bridesburg, Philadelphia.
Bakelite Corp., 247 Park Ave., New York, N. Y.
Carborundum Co., Niagara Falls, N. Y.
Manhattan Rubber Mfg. Div. Raybestos-Manhattan, Inc., Passaic, N. J.
Norton Co., Worcester, Mass.

GUARDS FOR MACHINERY
New Britain-Gridley Mch. Co., New Britain, Ct.
Wiesman Mfg. Co., Dayton, O.

GUARDS FOR PUNCH PRESSES, SAFETY
Taylor-Shantz, Inc., Rochester, N. Y.
Wiesman Mfg. Co., Dayton, O.

HAMMERS, DROP
Bliss, E. W. Co., Toledo, O.
Morgan Engineering Co., Alliance, O.

HAMMERS, FORGING AIR
Nazel Engineering & Machine Wks., Philadelphia, Pa.

HAMMERS, HELVE
High Speed Hammer Co., Inc., Rochester, N. Y.

HAMMERS, POWER
High Speed Hammer Co., Inc., Rochester, N. Y.
Nazel Engineering & Machine Wks., Philadelphia, Pa.

HAMMERS, SOFT
Greene, Tweed & Co., 109 Duane St., New York City.

HAMMERS, STEAM
Morgan Engineering Co., Alliance, O.

HANGERS, SHAFT
Boston Gear Works, Inc., North Quincy, Mass.
Brown & Sharpe Mfg. Co., Providence.
Fafnir Bearing Co., New Britain, Conn.
Hyatt Roller Bearing Co., Newark, N. J.
Link-Belt Co., Chicago.
New Departure Mfg. Co., Bristol, Ct.
Shafer Bearing Corp., 6519 W. Grand Ave., Chicago.
S. K. F. Industries, Inc., Philadelphia.
Standard Pressed Steel Co., Jenkintown, Pa.
Wood's, T. B., Sons, Co., Chambersburg, Pa.

HARDNESS TESTING INSTRUMENTS
Shore Instrument & Mfg. Co., Jamaica, N. Y.
Wilson Mechanical Instrument Co., Inc., 382 Concord Ave., New York.

HEAT TREATMENT OF STEEL
American Metal Treatment Co., Elizabeth, N. J.
Bennett Metal Treating Co., Elmwood, Conn.
Davis Boring Tool Co., Inc., 6200 Maple Ave., St. Louis, Mo.

HOBBIING MACHINES
See Gear Cutting Machines, Helical and Spur (Hob) and Gear Cutting Machines, Worms and Worm Wheels (Hob).

HOBBS
Barber-Colman Co., Rockford, Ill.
Brown & Sharpe Mfg. Co., Providence.
Ex-Cell-O Aircraft & Tool Corp., Detroit, Mich.
Greenfield Tap & Die Corp., Greenfield, Mass.
Illinois Tool Works, 2501 North Keeler Ave., Chicago, Ill.
Michigan Tool Co., Detroit, Mich.
National Twist Drill & Tool Co., Detroit, Mich.
Union Twist Drill Co., Athol, Mass.

HOIST HOOKS
Williams, J. H., & Co., 75 Spring St., New York, N. Y.

HOISTING AND CONVEYING MACHINERY
Harnischfeger Corp., Milwaukee, Wis.
Link-Belt Co., Chicago.
Shepard Niles Crane & Hoist Corp., 444 Schuyler Ave., Montour Falls, N. Y.

HOISTS, CHAIN, ETC.
Ford Chain Block Co., Philadelphia.
Ryerson, Joseph T., & Son, Inc., 2558 West 16th St., Chicago, Ill.

HOISTS, ELECTRIC
Harnischfeger Corp., Milwaukee, Wis.
Philadelphia Gear Works, Philadelphia.
Shepard Niles Crane & Hoist Corp., 444 Schuyler Ave., Montour Falls, N. Y.

HONES
Hutto Machine Div. Carborundum Co., Detroit, Mich.

HONING MACHINES, CYLINDER
Barnes Drill Co., 814 Chestnut St., Rockford, Ill.
Hutto Machine Div. Carborundum Co., Detroit, Mich.
Ingersoll Milling Mch. Co., Rockford, Ill.
Moline Tool Co., Moline, Ill.

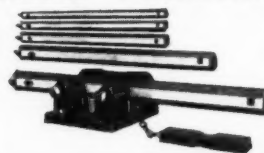
HOSE, RUBBER, METALLIC, ETC.
Manhattan Rubber Mfg. Div. Raybestos-Manhattan, Inc., Passaic, N. J.

HYDRAULIC EQUIPMENT
Elmes, Chas. F., Engineering Works, 222 N. Morgan St., Chicago.
Hannifin Mfg. Co., 621-631 S. Kolmar Ave., Chicago.
Morgan Engineering Co., Alliance, O.
Oilgear Co., Milwaukee, Wis.

HYDRAULIC HEAD UNITS
National Automatic Tool Co., Richmond, Ind.
Ex-Cell-O Aircraft & Tool Corp., Detroit, Mich.
Barnes, W. F., & John Co., Rockford, Ill.
Ingersoll Milling Mch. Co., Rockford, Ill.

INDEX CENTERS
Abrasive Machine Tool Co., East Providence, R. I.
Brown & Sharpe Mfg. Co., Providence.

RAPID PRODUCTION BORING TOOLS



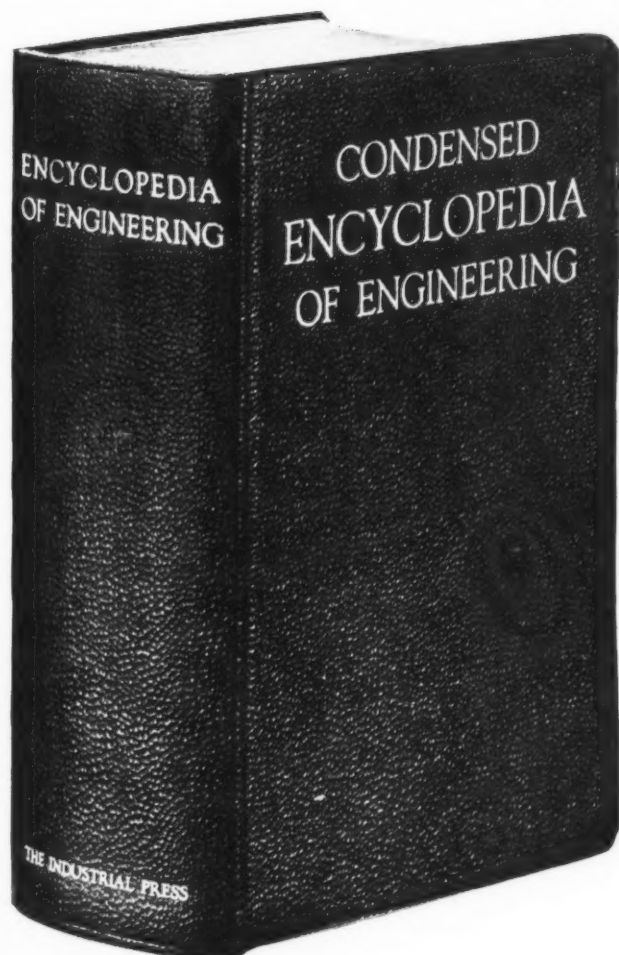
Holders are Steel Castings. Bars are Tool Steel, Oil Hardened. Wonderful rigidity and convenience. Cuts the cost of engine-lathe boring. Circulars on request.

F. A. KERSHAW, KENT, OHIO

Condensed Encyclopedia of Engineering

The user of this rapid reference book obtains essential facts only, without wasting time in culling them from a mass of reading matter.

Price
\$6⁰⁰



THIS Condensed Encyclopedia gives the outstanding facts about 4150 subjects, including such useful matter as the composition and strength of all kinds of standard and special metals used in machine construction; all of the important mechanical laws, rules and principles; brief, simple descriptions of various classes of manufacturing equipment and processes; applications of a wide range of metal-working machines, special tools and instruments; definitions of technical words, shop and trade terms; and **MOST IMPORTANT OF ALL**—established results and data of great practical value to all designers and builders of mechanical and electrical apparatus.

The Condensed Encyclopedia is flexibly bound in dark blue Atholeather. Page is 4½" x 7"—clear, readable type. Thumb indexed for quick reference, and all subjects arranged alphabetically under headings naturally looked for.

See coupon for terms and examination

THE INDUSTRIAL PRESS

148 Lafayette St., New York City.

M-8/36

Send me a copy of the CONDENSED ENCYCLOPEDIA OF ENGINEERING—Price \$6.00. I enclose \$2.00—initial payment—the remainder payable at the rate of \$2.00 a month for two months. Or I enclose \$5.70 (\$6.00 less 5% cash discount) payment in full.

I have the right to return the book in five days and money will be refunded.

Name

Home Address

City and State

Firm

Position

INDICATORS, DIAL

Federal Products Corp., Providence, R. I.
Starrett, L. S., Co., Athol, Mass.

INDICATORS, SPEED

Brown & Sharpe Mfg. Co., Providence
Greene, Tweed & Co., 109 Duane St.
New York City.

Scherr, Geo. Co., 128 Lafayette St.,
New York City.

Starrett, L. S., Co., Athol, Mass.

INDICATORS, TEST

Brown & Sharpe Mfg. Co., Providence.
Federal Products Corp., Providence.
Norton Co., Worcester, Mass.

Starrett, L. S., Co., Athol, Mass.

INTENSIFIERS, HYDRAULIC

Elmes, Chas. F., Engineering Works,
222 N. Morgan St., Chicago.
Morgan Engineering Co., Alliance, O.

JACKS, PLANER

Armstrong Brothers Tool Co., 313 N.
Francisco Ave., Chicago.

JIG BORING EQUIPMENT

Craley, C. C., Mfg. Co., Shillington, Pa.

JIGS AND FIXTURES

Brown & Sharpe Mfg. Co., Providence.
Cleveland Universal Jig Co., Cleveland.
Columbus Die, Tool & Machine Co.,
Columbus, O.

Gisholt Machine Co., Madison, Wis.
Hartford Special Mch. Co., Hartford,
Conn.

Ingersoll Milling Mch. Co., Rockford, Ill.
Manufacturers' Consulting Engineers,
Syracuse, N. Y.

Pratt & Whitney Co., Hartford, Conn.
Ruthman Machinery Co., 534-536 E.
Front St., Cincinnati, O.

Sundstrand Machine Tool Co., Rock-
ford, Ill.

Taylor-Shantz, Inc., Rochester, N. Y.

KEYSEATERS

Baker Brothers, Inc., Toledo, O.
Davis Keyseater Co., Rochester, N. Y.

KNURL HOLDERS

Graham Mfg. Co., Providence, R. I.

Pratt & Whitney Co., Hartford, Conn.

KNURLING TOOLS

Armstrong Brothers Tool Co., 313 N.
Francisco Ave., Chicago.

Pratt & Whitney Co., Hartford, Conn.
Williams, J. H., & Co., 75 Spring St.,
New York City.

LADDERS, SAFETY

Dayton Safety Ladder Co., Cincinnati.

LAMPS, ELECTRIC

General Electric Vapor Lamp Co.,
Hoboken, N. J.

LAPPING MACHINES

Cincinnati Grinders, Inc., Cincinnati.

Norton Co., Worcester, Mass.

LAPPING WHEELS, DIAMOND

Prosser, Thomas, & Son, 15 Gold St.,
New York, N. Y.

LATHE ATTACHMENTS

Cincinnati Lathe & Tool Co., Oakley,
Cincinnati, O.

Hardinge Brothers, Inc., Elmira, N. Y.

LeBlond, R. K., Mch. Tool Co., Cin-
cinnati, O.

Lodge & Shipley Machine Tool Co.,
Cincinnati, O.

McCrosky Tool Corp., Meadville, Pa.

Reed-Prentice Corp., Worcester, Mass.

Rivett Lathe & Grinder, Inc., Brighton,
Boston, Mass.

Seneca Falls Mch. Co., Seneca Falls,
N. Y.

Springfield Mch. Tool Co., 631 South-
ern Ave., Springfield, O.

Sundstrand Mch. Tool Co., Rockford,
Ill.

LATHE DOGS

Armstrong Brothers Tool Co., 313 N.
Francisco Ave., Chicago.

Ready Tool Co., Bridgeport, Conn.

Williams, J. H., & Co., 75 Spring St.,
New York City.

LATHES, AUTOMATIC

Gisholt Machine Co., Madison, Wis.

Goss & De Leeuw Machine Co., New
Britain, Ct.

Jones & Lamson Machine Co., Spring-
field, Vt.

LeBlond, R. K., Mch. Tool Co., Cin-
cinnati, O.

National Acme Co., Cleveland, O.

New Britain-Gridley Mch. Co., New
Britain, Ct.

Potter & Johnston Mch. Co., Paw-
tucket, R. I.

Pratt & Whitney Co., Hartford, Conn.

Reed-Prentice Corp., Worcester, Mass.

Rockford Machine Tool Co., 2412
Kishwaukee Road, Rockford, Ill.

Sundstrand Machine Tool Co., Rock-
ford, Ill.

LATHES, AXLES AND SHAFT

Consolidated Machine Tool Corporation,
Rochester, N. Y.

Seneca Falls Machine Co., Seneca Falls,
New York.

Sundstrand Machine Tool Co., Rock-
ford, Ill.

LATHES, BENCH

Ames, B. C. Co., Waltham, Mass.

Atlas Press Co., Kalamazoo, Mich.

Hardinge Brothers, Inc., Elmira, N. Y.

LeBlond, R. K., Mch. Tool Co., Cin-
cinnati, O.

Pratt & Whitney Co., Hartford, Conn.

Rivett Lathe & Grinder Inc., Brighton,
Boston, Mass.

Seneca Falls Machine Co., Seneca Falls,
New York.

South Bend Lathe Works, Inc., South
Bend, Ind.

Van Norman Mch. Tool Co., Spring-
field, Mass.

LATHES, BORING

Gisholt Machine Co., Madison, Wis.

LATHES, BRASS WORKERS'

Acme Machine Tool Co., Cincinnati.

Seneca Falls Machine Co., Seneca Falls,
New York.

Springfield Mch. Tool Co., 631 South-
ern Ave., Springfield, O.

Warner & Swasey Co., Cleveland.

LATHES, CRANKSHAFT

LeBlond, R. K., Mch. Tool Co., Cin-
cinnati, O.

Lodge & Shipley Machine Tool Co.,
Cincinnati, O.

Sundstrand Machine Tool Co., Rock-
ford, Ill.

LATHES, DOUBLE-END

Greenlee Bros., & Co., Rockford, Ill.

Sundstrand Machine Tool Co., Rock-
ford, Ill.

LATHES, ENGINE AND TOOLROOM

Acme Machine Tool Co., Cincinnati.

Boye & Emmes Mch. Tool Co., Cin-
cinnati, O.

Cincinnati Lathe & Tool Co., Oakley,
Cincinnati, O.

Consolidated Machine Tool Corporation,
Rochester, N. Y.

Gisholt Machine Co., Madison, Wis.

Hardinge Brothers, Inc., Elmira, N. Y.

LeBlond, R. K., Mch. Tool Co., Cin-
cinnati, O.

Lehmann Machine Co., St. Louis, Mo.

Lodge & Shipley Machine Tool Co.,
Cincinnati, O.

Porter-Cable Machine Co., Salina and
Wolf Streets, Syracuse, N. Y.

Pratt & Whitney Co., Hartford, Conn.

Reed-Prentice Corp., Worcester, Mass.

Ryerson, Joseph T., & Son, Inc., 2458
West 16th St., Chicago, Ill.

Seneca Falls Machine Co., Seneca Falls,
New York.

Sidney Machine Tool Co., Sidney, O.

South Bend Lathe Works, Inc., South
Bend, Ind.

Springfield Mch. Tool Co., 631 South-
ern Ave., Springfield, O.

**LATHES, EXTENSION BED AND
GAP**

Cincinnati Lathe & Tool Co., Oakley,
Cincinnati, O.

Consolidated Machine Tool Corporation,
Rochester, N. Y.

LeBlond, R. K., Mch. Tool Co., Cin-
cinnati, O.

South Bend Lathe Works, Inc., South
Bend, Ind.

LATHES, GUN BORING

Springfield Mch. Tool Co., 631 South-
ern Ave., Springfield, O.

LATHES, SPINNING

See Chucking Machines.

LATHES, TOOLROOM

See Lathes, Engine and Toolroom



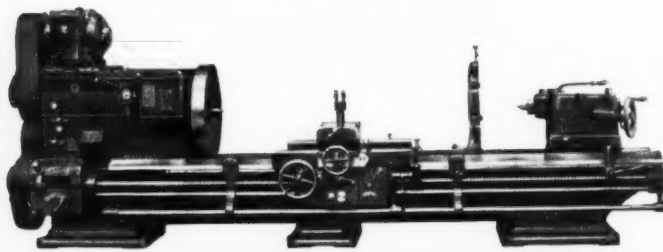
SPEED AND ACCURACY...

It's simple with the LeBlond feed box. A cone of gears on an intermediate shaft roll in anti-friction bearings, and a set of sliding gears are housed in a one-piece casting. Two levers control entire range of threads and feeds from direct reading index, giving you that speedy and accurate handling so necessary to rapid production.

With the LeBlond lathe, this simple, efficient, satisfactory service continues year after year without variation. Write for descriptive literature.

The R. K. LeBlond Machine Tool Co.
Cincinnati, Ohio, U. S. A.

30-inch
Heavy Duty
Engine Lathe





Each Head Can Turn Two Different-Sized Nuts

This is a great saving over Ratchet Wrenches that turn only one nut in each head, as it means fewer parts to keep on hand.

THE FAVORITE REVERSIBLE RATCHET WRENCH

Means greater efficiency and speed in nut turning, as you can use one side of head for one size nut, and by turning it over you can use the other side for a different-sized nut.

TWO WRENCHES IN ONE

Reverse motion instantaneous by simply turning pawl. Opening clear through head. Can be used in narrow places.

Works on a straight-ahead ratchet motion, and head does not leave nut until operation is completed.

Send
for Full
Particulars.

GREENE, TWEED & CO.

Sole Manufacturers

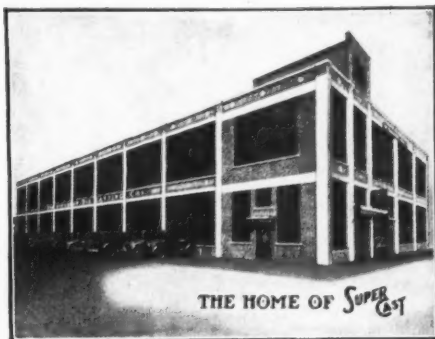
109 Duane St., New York, N. Y.

Better
Methods

Better
Die
Castings



Since 1919



THE HOME OF **SUPER CAST**

The Superior Die Casting Co.
CLEVELAND, OHIO

CINCINNATI CHICAGO PITTSBURGH DETROIT NEW YORK

JIGS

when correctly designed, often determine the difference between Profit and Loss. Columbus-made Jigs increase production and promote economy. Talk it over with specialists of 30 years' experience in making Jigs and

FIXTURES—TOOLS—DIES AND SPECIAL MACHINERY

Send in your requests—no obligation.

THE COLUMBUS DIE, TOOL & MACHINE CO., COLUMBUS, O.

CINCINNATI LATHES

Supplied in sizes from 14" to 32" inclusive, belt or motor drive. To them we fit any standard or special attachments. Send sketches of your work, then let us prove how much we can reduce your costs. Our tool room lathes improve precision. Supplied in 14", 16", 18" and 20" sizes. **SPECIALISTS OVER 30 YEARS.**

THE CINCINNATI LATHE & TOOL CO.

OAKLEY, CINCINNATI, OHIO, U. S. A.

GAMMONS
OF
Manchester



PRODUCTION TOOLS

ORIGINATORS AND
MANUFACTURERS OF HELICAL
FLUTED TAPER PIN REAMERS

THE GAMMONS-HOLMAN CO., MANCHESTER, CONNECTICUT

LATHES, TURRET

Acme Machine Tool Co., Cincinnati.
Brown & Sharpe Mfg. Co., Providence.
Bullard Co., Bridgeport, Conn.
Cincinnati Lathe & Tool Co., Oakley, Cincinnati, O.
Gisholt Machine Co., Madison, Wis.
Greenlee Bros. & Co., Rockford, Ill.
Hardinge Brothers, Inc., Elmira, N. Y.
International Mch. Tool Co., Indianapolis, Ind.
Jones & Lamson Machine Co., Springfield, Vt.
LeBlond, R. K., Mch. Tool Co., Cincinnati, O.
Lodge & Shipley Machine Tool Co., Cincinnati, O.
National Acme Co., Cleveland, O.
New Britain-Gridley Mch. Co., New Britain, Ct.
Pratt & Whitney Co., Hartford, Conn.
Rivett Lathe & Grinder Inc., Brighton, Boston, Mass.
South Bend Lathe Works, Inc., South Bend, Ind.
Springfield Mch. Tool Co., 631 Southern Ave., Springfield, O.
Warner & Swasey Co., Cleveland.

LEVELS

Pratt & Whitney Co., Hartford, Conn.
Starrett, L. S., Co., Athol, Mass.
Universal Boring Machine Co., Hudson, Mass.

LOCK NUTS

Columbia Nut & Bolt Co., Inc., Bridgeport, Ct.

LUBRICANTS

Houghton, E. F. & Co., Philadelphia, Pa.
Pyroll Co., LaCrosse, Wis.
Socony Vacuum Oil Co., Inc., 26 Broadway, New York, N. Y.
Sun Oil Co., Philadelphia.
Texas Co., 135 E. 42nd St., New York.

LUBRICATING SYSTEMS

Greene, Tweed & Co., 109 Duane St., New York City.
Madison-Kipp Corp., Madison, Wis.
Rivett Lathe & Grinder Inc., Brighton, Boston, Mass.

LUBRICATORS FOR AIR LINES

Norgren, C. A., Co., Inc., Denver, Colo.

MACHINISTS' SMALL TOOLS

See Calipers, Hammers, Wrenches, Drills, Taps, etc.

MANDRELS, EXPANDING AND SOLID

See Arbors and Mandrels, Expanding and Solid.

MARKING MACHINES

V & O Press Co., Hudson, N. Y.

MEASURING MACHINES, PRECISION

Federal Products Corp., Providence.
Hanson-Whitney Mch. Co., Hartford, Conn.
Norma-Hoffmann Bearings Corp., Stamford, Conn.
Pratt & Whitney Co., Hartford, Conn.
Scherr, Geo. Co., 128 Lafayette St., New York City.

METALS, BEARING

See Bearing Bronze, Babbitt, etc., and Bushings, Brass, Bronze, etc.

METALLOGRAPHIC EQUIPMENT

Bausch & Lomb Optical Co., 619 St. Paul St., Rochester, New York.
Scherr, Geo. Co., 128 Lafayette St., New York City.

METERS (See Recording Instruments)**MICROMETERS**

Bath, John & Co., Inc., Worcester, Mass.
Brown & Sharpe Mfg. Co., Providence.
Pratt & Whitney Co., Hartford, Conn.
Starrett, L. S., Co., Athol, Mass.

MICROSCOPES, TOOLMAKERS'

Bausch & Lomb Optical Co., 619 St. Paul St., Rochester, New York.
Scherr, Geo. Co., 128 Lafayette St., New York City.

MILLING AND DRILLING

MACHINES, UPRIGHT
See Drilling and Milling Machines, Vertical.

MILLING ATTACHMENTS

Brown & Sharpe Mfg. Co., Providence.
Cincinnati Milling Machine Co., Oakley, Cincinnati, Ohio.
Ingersoll Milling Mch. Co., Rockford, Ill.
LeBlond, R. K., Mch. Tool Co., Cincinnati, O.
Porter-Cable Machine Co., Salina and Wolf Streets, Syracuse, N. Y.
Reed-Prentice Corp., Worcester, Mass.
Rivett Lathe & Grinder Inc., Brighton, Boston, Mass.
Sundstrand Machine Tool Co., Rockford, Ill.
Van Norman Mch. Tool Co., Springfield, Mass.

MILLING MACHINES, AUTOMATIC

Brown & Sharpe Mfg. Co., Providence.
Cincinnati Milling Machine Co., Oakley, Cincinnati, Ohio.
Ingersoll Milling Mch. Co., Rockford, Ill.
Potter & Johnston Mch. Co., Pawtucket, R. I.
Pratt & Whitney Co., Hartford, Conn.
Sundstrand Machine Tool Co., Rockford, Ill.

MILLING MACHINES, BENCH

Ames, B. G., Co., Waltham, Mass.
Hardinge Brothers, Inc., Elmira, N. Y.
Pratt & Whitney Co., Hartford, Conn.
Sundstrand Machine Tool Co., Rockford, Ill.

MILLING MACHINES, CIRCULAR CONTINUOUS

Consolidated Machine Tool Corporation, Rochester, N. Y.
Ingersoll Milling Mch. Co., Rockford, Ill.
Sundstrand Machine Tool Co., Rockford, Ill.

MILLING MACHINES, DUPLEX

Brown & Sharpe Mfg. Co., Providence.
Ingersoll Milling Mch. Co., Rockford, Ill.
Van Norman Mch. Tool Co., Springfield, Mass.

MILLING MACHINES, HAND

Frew Machine Co., Philadelphia, Pa.
Pratt & Whitney Co., Hartford, Conn.
Sundstrand Machine Tool Co., Rockford, Ill.
Van Norman Mch. Tool Co., Springfield, Mass.

MILLING MACHINES, HORIZONTAL, PLAIN AND UNIVERSAL

Brown & Sharpe Mfg. Co., Providence.
Cincinnati Milling Machine Co., Oakley, Cincinnati, Ohio.
Ingersoll Milling Mch. Co., Rockford, Ill.
LeBlond, R. K., Mch. Tool Co., Cincinnati, O.
Rowbottom Machine Co., Waterbury, Conn.
Ryerson, Joseph T. & Son, Inc., 2558 West 16th St., Chicago, Ill.
Sidney Machine Tool Co., Sidney, O.
Sundstrand Machine Tool Co., Rockford, Ill.
Van Norman Mch. Tool Co., Springfield, Mass.

MILLING MACHINES, LINCOLN TYPE

Brown & Sharpe Mfg. Co., Providence.
Pratt & Whitney Co., Hartford, Conn.
Sundstrand Machine Tool Co., Rockford, Ill.
Van Norman Mch. Tool Co., Springfield, Mass.

MILLING MACHINES, MULTIPLE SPINDLE

Ingersoll Milling Mch. Co., Rockford, Ill.

MILLING MACHINES, PLANNER TYPE

Ingersoll Milling Mch. Co., Rockford, Ill.
Hall Planetary Co., Philadelphia.

MILLING MACHINES, PLANETARY

Brown & Sharpe Mfg. Co., Providence.

MILLING MACHINES, UNIVERSAL

Cincinnati Milling Machine Co., Oakley, Cincinnati, Ohio.
Gorton, Geo., Mch. Co., 1109 13th St., Racine, Wis.
Ingersoll Milling Mch. Co., Rockford, Ill.
Ryerson, Joseph T. & Son, Inc., 2558 West 16th St., Chicago, Ill.
Sundstrand Machine Tool Co., Rockford, Ill.

MILLING MACHINES, VERTICAL

Brown & Sharpe Mfg. Co., Providence.
Cincinnati Milling Machine Co., Oakley, Cincinnati, Ohio.
Gorton, Geo., Mch. Co., 1109 13th St., Racine, Wis.
Ingersoll Milling Mch. Co., Rockford, Ill.
Reed-Prentice Corp., Worcester, Mass.
Sundstrand Machine Tool Co., Rockford, Ill.
Van Norman Mch. Tool Co., Springfield, Mass.

MILLING TOOLS, HOLLOW

Geometric Tool Co., New Haven, Conn.

MODEL AND EXPERIMENTAL WORK

See Special Machinery and Tools.

MOLDED PLASTIC PRODUCTS

Bakelite Corp., 247 Park Ave., New York, N. Y.

MOLYBDENUM

Climax Molybdenum, 500 Fifth Ave., New York, N. Y.

MOTORS, ELECTRIC

Allis-Chalmers Mfg. Co., Milwaukee, Wis.
Dumore Co., Racine, Wis.
Fairbanks-Morse & Co., 9th & Wabash Ave., Chicago.
General Electric Co., Schenectady, N. Y.
Lincoln Electric Co., Cleveland.

NAMEPLATES

Pittsburgh Stamp Co., Inc., Pittsburgh, Pa.

NIBBLING MACHINES

Campbell, Andrew C., Inc., Bridgeport, Conn.
Schatz Mfg. Co., Poughkeepsie, N. Y.

NICKEL

International Nickel Co., 67 Wall St., New York.

NIPPLE THREADING MACHINERY

Landis Mch. Co., Inc., Waynesboro, Pa.
Merrell Mfg. Co., Toledo, O.
Murchey Mch. & Tool Co., 951 Porter St., Detroit.

NUT SETTING EQUIPMENT

See Screw Driving and Nut Setting Equipment.

NUT TAPPERS

See Bolt and Nut Machinery.

OIL CUPS

Boston Gear Works, Inc., North Quincy, Mass.
Gits Bros. Mfg. Co., 1846 S. Kilbourn Ave., Chicago.

OIL GROOVERS

Hanson-Whitney Mch. Co., Hartford, Conn.

OIL HOLE COVERS

Gits Bros. Mfg. Co., 1846 S. Kilbourn Ave., Chicago.

OILERS

Madison-Kipp Corp., Madison, Wis.

OILS, LUBRICATING

Houghton, E. F. & Co., Philadelphia, Pa.
Pyroll Co., LaCrosse, Wis.
Socony Vacuum Oil Co., Inc., 26 Broadway, New York, N. Y.
Sun Oil Co., Philadelphia.
Texas Co., 135 E. 42nd St., New York.

OILS, QUENCHING AND TEMPERING

Houghton, E. F. & Co., Philadelphia, Pa.

OILS, SOLUBLE

See Compounds, Cutting, Grinding, etc.

OXYGEN

Linde Air Products Co., 30 E. 42nd St., New York.

PACKING, LEATHER, METAL, RUBBER, ETC.

Garlock Packing Co., Palmyra, N. Y.
Houghton, E. F. & Co., Philadelphia, Pa.

PACKING, RUBBER

Manhattan Rubber Mfg. Div. Raybestos-Manhattan, Inc., Passaic, N. J.

PARALLELS

Starrett, L. S., Co., Athol, Mass.
Walker, O. S., Co., Inc., Worcester, Mass.

PATTERN SHOP MACHINERY

Porter-Cable Machine Co., Salina and Wolf Streets, Syracuse, N. Y.

PATTERNS, METAL

Mummert-Dixon Co., Hanover, Pa.
V & O Press Co., Hudson, N. Y.

PATTERNS, WOOD

V & O Press Co., Hudson, N. Y.

PHOSPHOR BRONZE

See Bronze.

PILLOW BLOCKS

Link-Belt Co., Chicago.
Shaver Bearing Corp., 6519 W. Grand Ave., Chicago.

PIPE CUTTING AND THREADING MACHINES

Foot-Burt Co., Cleveland, O.
Greenfield Tap & Die Corp., Greenfield, Mass.
Landis Mch. Co., Waynesboro, Pa.
Merrell Mfg. Co., Toledo, O.
Murchey Mch. & Tool Co., 951 Porter St., Detroit.

PIPE, STEEL

National Tube Co., (U.S. Steel Corp. Sub.) Pittsburgh, Pa.

PIPE TONGS

Williams, J. H. & Co., 75 Spring St., New York, N. Y.

PLANNER ATTACHMENTS

Cincinnati Planer Co., Cincinnati, O.
Hanson-Whitney Mch. Co., Hartford, Conn.

PLANERS

Cincinnati Planer Co., Cincinnati, O.
Consolidated Machine Tool Corporation, Rochester, N. Y.
Rockford Machine Tool Co., Rockford, Ill.

PLATE ROLLS

Ryerson, Joseph T. & Son, Inc., 2558 West 16th St., Chicago, Ill.
Schatz Mfg. Co., Poughkeepsie, N. Y.

PLATES, SURFACE

Brown & Sharpe Mfg. Co., Providence.

PNEUMATIC DIE CUSHIONS FOR POWER PRESSES

Marquette Tool & Mfg. Co., Toledo, O.

PNEUMATIC EQUIPMENT

Hannifin Mfg. Co., 621 S. Kolmar Ave., Chicago.

POLISHING LATHES AND MACHINES

Diamond Machine Co., Providence, R. I.
Gardner Machine Co., 414 E. Gardner St., Beloit, Wis.
New Britain-Gridley Mch. Co., New Britain, Ct.
Production Mch. Co., Greenfield, Mass.

PRESSES, ARBOR

Atlas Press Co., Kalamazoo, Mich.
Barnes, W. F., & John Co., Rockford, Ill.
Elmes, Chas. F., Engineering Works, 222 N. Morgan St., Chicago.
Hannifin Mfg. Co., 621 S. Kolmar Ave., Chicago.

PRESSES, BROACHING

Atlas Press Co., Kalamazoo, Mich.
Bliss, E. W., Co., Toledo, O.
Lucas Mch. Tool Co., Cleveland, O.
Oilgear Co., Milwaukee, Wis.
V & O Press Co., Hudson, N. Y.

PRESSES, DROP

See Hammers, Drop.

PRESSES, FOOT

Baird Machine Co., Bridgeport, Conn.
Bliss, E. W., Co., Toledo, O.
Niagara Machine & Tool Wks., Buffalo, V & O Press Co., Hudson, N. Y.
Waterbury Farrel Fdry. & Mch. Co., Waterbury, Ct.

PRESSES, FORGING

Bliss, E. W., Co., Toledo, O.
Morgan Engineering Co., Alliance, O.
Niagara Machine & Tool Wks., Buffalo, Schatz Mfg. Co., Poughkeepsie, N. Y.
V & O Press Co., Hudson, N. Y.
Zeh & Hahnemann Co., Newark, N. J.

PRESSES, HYDRAULIC

Elmes, Chas. F., Engineering Works, 222 N. Morgan St., Chicago.
Hannifin Mfg. Co., 621 S. Kolmar Ave., Chicago.

PRESSES, PERCUSSION

Zeh & Hahnemann Co., Newark, N. J.

PRESSES, SCREW

Barnes, W. F., & John Co., Rockford, Ill.
Bliss, E. W., Co., Toledo, O.

PRESSES, SHEET METAL WORKING

Baird Machine Co., Bridgeport, Conn.
Bliss, E. W., Co., Toledo, O.
Loebhough-Jordan Tool & Mch. Co., Elkhart, Ind.

PRESSES, STRAIGHTENING

Elmes, Chas. F., Engineering Works, 222 N. Morgan St., Chicago.
Hannifin Mfg. Co., 621-631 S. Kolmar Ave., Chicago.

PRESSES, STRAIGHTENING

Morgan Engineering Co., Alliance, O.
Morse Twist Drill & Machine Co., New Bedford, Mass.

PROFILING MACHINES

Frew Machine Co., Philadelphia, Pa.
Gorton, Geo., Mch. Co., 1109 13th St., Racine, Wis.

PULLEYS

Link-Belt Co., Chicago.
Wood's, T. B., Sons Co., Chambersburg, Pa.

PULLEYS, FRICTION

Conway Clutch Co., 1547 Queen City Ave., Cincinnati, O.
Link-Belt Co., Chicago.
Wood's, T. B., Sons Co., Chambersburg, Pa.

PULLEY, V-BELT

Allis-Chalmers Mfg. Co., Milwaukee, Wis.

PUMPS, COOLANT, LUBRICANT AND OIL

Brown & Sharpe Mfg. Co., Providence.
Ruthman Machinery Co., 534-536 E. Front St., Cincinnati, O.
Viking Pump Co., Cedar Falls, Iowa.

PUMPS, HYDRAULIC

Buffalo Forge Co., Buffalo, New York.
Elmes, Chas. F., Engineering Works, 222 N. Morgan St., Chicago.
Oilgear Co., Milwaukee, Wis.
Viking Pump Co., Cedar Falls, Iowa.
Worthington Pump & Mchry. Corp., Harrison, N. J.

PUMPS, ROTARY

Leiman Bros., Inc., Newark, N. J.
National Acme Co., Cleveland, O.
Viking Pump Co., Cedar Falls, Iowa.
Worthington Pump & Mchry. Corp., Harrison, N. J.

PUMPS, VACUUM

Allis-Chalmers Mfg. Co., Milwaukee, Wis.
Leiman Bros., Inc., Newark, N. J.
Worthington Pump & Mchry. Corp., Harrison, N. J.

PUNCHING MACHINERY

Armstrong-Blum Mfg. Co., 343 N. Francisco Ave., Chicago.
Buffalo Forge Co., Buffalo, New York.
Consolidated Machine Tool Corporation, Rochester, N. Y.

PUNCHING MACHINERY

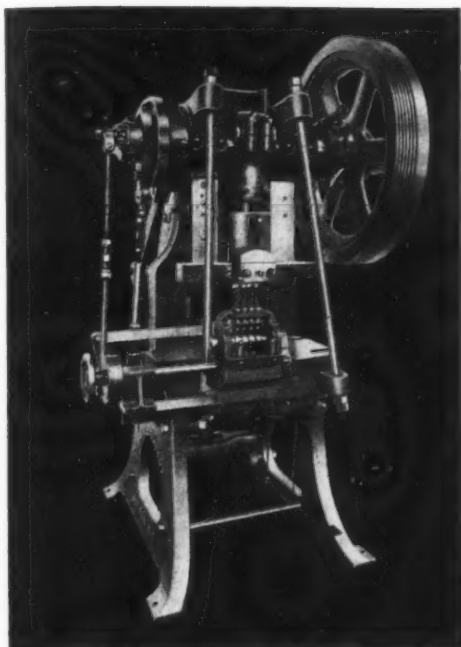
Loebhough-Jordan Tool & Mch. Co., Elkhart, Ind.

PYROMETERS

American Gas Furnace Co., Elizabeth, N. J.
Illinois Testing Laboratory, Inc., 320 N. LaSalle St., Chicago.


PYROMETERS

Leeds & Northrup Co., Philadelphia.
Russell Electric Co., 354 Huron St., Chicago.
Shore Instrument & Mfg. Co., Jamaica, N. Y.



Versatility is what makes a press the marvelous tool that it is. This is especially true with V & O Presses.

Here is a plain V & O Press, equipped with a special roll feed for making parts, as illustrated below, of 1/32 Cold Rolled Steel. Four floating rollers are on the upper shaft. The rollers are held down under spring tension to compensate for the variation of thickness in the material. An eccentric motion carries the parts from front to back after they are fed and cut off. The result is

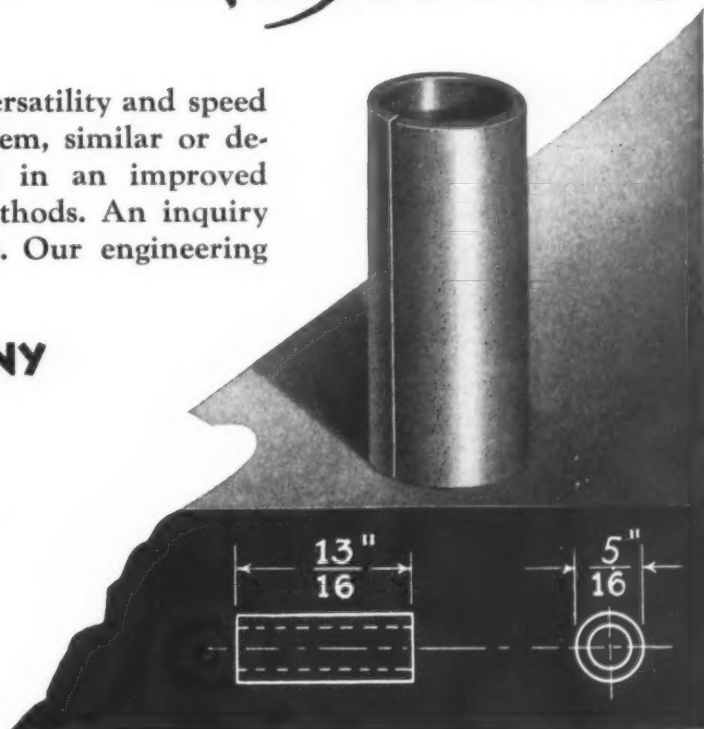
4 at  ONE time

—an example, not at all unusual, of the versatility and speed of V & O Presses. You may have a problem, similar or decidedly different, which can be solved in an improved manner by one of the V & O Press methods. An inquiry may prove to be exceptionally profitable. Our engineering staff is at your service!

THE V & O PRESS COMPANY
HUDSON, NEW YORK

AGENTS

Henry Prentiss & Co., New York, Hartford, Boston, Syracuse, Buffalo.
Marshall & Huschart Machinery Co., Chicago, Milwaukee.
Sterling-French Machinery Co., Detroit.
George L. Lind, Philadelphia.
Milholland Sales & Mch. Co., Indianapolis.
William K. Stamets, Pittsburgh, Cleveland.
Arthur Jackson Machine Tool Co., Toronto, Montreal.
Elliott & Stephens Machinery Co., St. Louis.
Tidewater Supply Co., Norfolk, Va., Columbia, S.C., Asheville, N. C.
D. S. Mair Machinery Corp., Houston and Dallas, Texas.
Meyer Machinery Co., Los Angeles, Cal.



RACKS, GEAR, CUT

Boston Gear Works, Inc., North Quincy, Mass.
 Fellows Gear Shaper Co., Springfield, Vt.
 Hartford Special Mch. Co., Hartford, Conn.
 Massachusetts Gear & Tool Co., 34 Nashua St., Woburn, Mass.
 Philadelphia Gear Works, Philadelphia.
 Stahl Gear & Machine Co., Cleveland.

RADIATORS, JAPANNING-OVEN

American Gas Furnace Co., Elizabeth, N. J.

REAMER HOLDERS

Landis Mch. Co., Inc., Waynesboro, Pa.
 McCroskey Tool Corp., Meadville, Pa.

REAMERS

Barber-Colman Co., Rockford, Ill.
 Brown & Sharpe Mfg. Co., Providence, Carboloy Co., Inc., Detroit, Mich.
 Card, S. W., Mfg. Co., Mansfield, Mass.
 Cleveland Twist Drill Co., Cleveland, O.
 Columbus Die, Tool & Machine Co., Columbus, O.
 Davis Boring Tool Co., Inc., 6200 Maple Ave., St. Louis, Mo.
 Ex-Cell-O Aircraft & Tool Corp., Detroit, Mich.
 Gammons-Holman Co., Manchester, Conn.
 Greenfield Tap & Die Corp., Greenfield, Mass.
 Haynes Stellite Co., Kokomo, Ind.
 Illinois Tool Works, 2501 North Keeler Ave., Chicago, Ill.
 McCroskey Tool Corp., Meadville, Pa.
 Morse Twist Drill & Machine Co., New Bedford, Mass.
 National Twist Drill & Tool Co., Detroit, Mich.
 Pratt & Whitney Co., Hartford, Conn.
 Standard Tool Co., Cleveland, O.
 Union Twist Drill Co., Athol, Mass.

REAMERS, ADJUSTABLE

Barber-Colman Co., Rockford, Ill.
 Cleveland Twist Drill Co., Cleveland, O.
 Davis Boring Tool Co., Inc., 6200 Maple Ave., St. Louis, Mo.
 Gisholt Machine Co., Madison, Wis.
 Greenfield Tap & Die Corp., Greenfield, Mass.
 Hannifin Mfg. Co., 621 S. Kolmar Ave., Chicago.
 McCroskey Tool Corp., Meadville, Pa.
 Morse Twist Drill & Machine Co., New Bedford, Mass.
 Pratt & Whitney Co., Hartford, Conn.
 Union Twist Drill Co., Athol, Mass.

REAMERS, TAPER PIN HOLE

Gammons-Holman Co., Manchester, Conn.
 Greenfield Tap & Die Corp., Greenfield, Mass.
 Pratt & Whitney Co., Hartford, Conn.
 Union Twist Drill Co., Athol, Mass.

REAMING MACHINES

Blanchard Machine Co., 64 State St., Cambridge, Mass.

RECORDING INSTRUMENTS FOR ELECTRICITY

General Electric Co., Schenectady, N. Y.
 Leeds & Northrup Co., Philadelphia.

RECORDING INSTRUMENTS FOR PRESSURE

Leeds & Northrup Co., Philadelphia.

RECORDING INSTRUMENTS FOR SPEED

Leeds & Northrup Co., Philadelphia.

RECORDING INSTRUMENTS FOR TEMPERATURE

Leeds & Northrup Co., Philadelphia.

RECORDING INSTRUMENTS FOR TIME

Gisholt Machine Co., Madison, Wis.

REGULATORS, TEMPERATURE

American Gas Furnace Co., Elizabeth, N. J.

REMOVERS, JAPAN, ENAMEL, ETC.

Oakite Products, Inc., 26 Thames St., New York City.

RHEOSTATS

General Electric Co., Schenectady, N. Y.

RIVETERS, HYDRAULIC

Morgan Engineering Co., Alliance, O.

RIVETERS, PNEUMATIC

Grant Mfg. & Mch. Co., N. W. Station, Bridgeport, Conn.
 Hannifin Mfg. Co., 621 S. Kolmar Ave., Chicago.

RIVETING MACHINES

Buffalo Forge Co., Buffalo, New York.
 Grant Mfg. & Mch. Co., N. W. Station, Bridgeport, Conn.
 High Speed Hammer Co., Inc., Rochester, N. Y.

ROPE DRIVES

Wood's, T. B., Sons Co., Chambersburg, Pa.

RUBBER PRODUCTS

Manhattan Rubber Mfg. Div. Raybestos-Manhattan, Inc., Passaic, N. J.

RULES, STEEL

Brown & Sharpe Mfg. Co., Providence.
 Starrett, L. S., Co., Athol, Mass.

RUST PREVENTIVE

Houghton, E. F., & Co., Philadelphia, Pa.
 Oakite Products, Inc., 26 Thames St., New York City.

SAFETY GUARDS FOR PUNCH PRESSES

Taylor-Shantz, Inc., Rochester, N. Y.
 Wiesman Mfg. Co., Dayton, O.

SAND BLAST EQUIPMENT

Leiman Bros., Inc., Newark, N. J.

SANDERS

Porter-Cable Machine Co., Salina and Wolf Streets, Syracuse, N. Y.
 Production Machine Co., Greenfield, Mass.
 Walls Sales Corp., 96 Warren St., New York.

SAW BLADES, HACK

Armstrong-Blum Mfg. Co., 343 N. Francisco Ave., Chicago.
 Disston, Henry, & Sons, Inc., Philadelphia, Pa.
 Starrett, L. S., Co., Athol, Mass.

SAW FRAMES, HACK

Disston, Henry, & Sons, Inc., Philadelphia, Pa.

SAW TABLES

Baker Brothers, Inc., Toledo, O.

SAWING MACHINES, CIRCULAR

Armstrong-Blum Mfg. Co., 343 N. Francisco Ave., Chicago.

SAWING MACHINES, FRICTION

Ryerson, Joseph T., & Son, Inc., 2558 W. 16th St., Chicago, Ill.

SAWING MACHINES, METAL CUTTING BAND

Armstrong-Blum Mfg. Co., 343 N. Francisco Ave., Chicago.
 Racine Tool & Mch. Co., 1752 State St., Racine, Wis.

SAWING MACHINES, POWER HACK

Armstrong-Blum Mfg. Co., 343 N. Francisco Ave., Chicago.

SAWING MACHINES, WOOD

Barnes, W. F., & John Co., Rockford, Ill.

SAWS, CIRCULAR METAL CUTTING

Disston, Henry, & Sons, Inc., Philadelphia, Pa.
 Union Twist Drill Co., Athol, Mass.

SAWS, HOLE

Armstrong-Blum Mfg. Co., 343 N. Francisco Ave., Chicago.

SAWS, METAL CUTTING BAND

Disston, Henry, & Sons, Inc., Philadelphia, Pa.

SAWS, SCREW SLOTTING

Barber-Colman Co., Rockford, Ill.
 Starrett, L. S., Co., Athol, Mass.
 Union Twist Drill Co., Athol, Mass.

SCREW CUTTING TOOLS

See Taps and Dies.

SCREW DRIVING AND NUT SETTING EQUIPMENT

Errington Mechanical Laboratory, 200 Broadway, N. Y.

Haskins, R. G., Co., 4634 Fulton St., Chicago.

Proconier Safety Chuck Co., 20 S. Clinton St., Chicago, Ill.

Strand, N. A., & Co., 5001 N. Lincoln St., Chicago.

SCREW MACHINES, AUTOMATIC SINGLE AND MULTIPLE SPINDLE

Brown & Sharpe Mfg. Co., Providence.

Cone Auto. Mch. Co., Inc., Windsor, Vt.

Greenlee Bros. & Co., Rockford, Ill.

National Acme Co., Cleveland, O.

New Britain-Gridley Mch. Co., New Britain, Ct.

SCREW MACHINES, HAND

See also Lathes, Turret.

Acme Machine Tool Co., Cincinnati.

Brown & Sharpe Mfg. Co., Providence.

Hardinge Brothers, Inc., Elmira, N. Y.

Jones & Lamson Machine Co., Springfield, Vt.

Potter & Johnston Machine Co., Pawtucket, R. I.

Pratt & Whitney Co., Hartford, Conn.

Rivett Lathe & Grinder Inc., Brighton, Boston, Mass.

Warner & Swasey Co., Cleveland.

SCREW MACHINE TOOLS AND EQUIPMENT

Brown & Sharpe Mfg. Co., Providence.

Greenlee Bros. & Co., Rockford, Ill.

Jones & Lamson Machine Co., Springfield, Vt.

Landis Mch. Co., Inc., Waynesboro, Pa.

Murphy Mch. & Tool Co., 951 Porter St., Detroit.

National Acme Co., Cleveland, O.

New Britain-Gridley Mch. Co., New Britain, Ct.

Potter & Johnston Machine Co., Pawtucket, R. I.

Pratt & Whitney Co., Hartford, Conn.

Warner & Swasey Co., Cleveland.

SCREW MACHINE WORK

Eastern Mch. Screw Corp., New Haven, Conn.

Link-Belt Co., Chicago.

National Acme Co., Cleveland, O.

New Britain-Gridley Mch. Co., New Britain, Ct.

Standard Pressed Steel Co., Jenkintown, Pa.

SCREW PLATES

Card, S. W., Mfg. Co., Mansfield, Mass.

Greenfield Tap & Die Corp., Greenfield, Mass.

Morse Twist Drill & Machine Co., New Bedford, Mass.

Pratt & Whitney Co., Hartford, Conn.

SCREWS, CAP, SET, SAFETY SET AND MACHINERY

Allen Mfg. Co., 125 Shelton St., Hartford, Conn.

National Acme Co., Cleveland, O.

Standard Pressed Steel Co., Jenkintown, Pa.

Strong, Carlisle & Hammond Co., Cleveland.

SCREWS, SELF-TAPPING DRIVE

Parker-Kalon Corp., 200 Varick St., New York.

SEALS AND RETAINERS, OIL OR GREASE

Garlock Packing Co., Palmyra, N. Y.

Gits Bros. Mfg. Co., 1846 S. Kilbourn Ave., Chicago.

SEAMLESS STEEL TUBING

See Tubing, Seamless Steel.

SECOND-HAND MACHINERY, ETC.

Cincinnati Machinery & Supply Co., Cincinnati.

Cincinnati Planer Co., Cincinnati, O.

Eastern Machinery Co., Cincinnati.

Emmerman, Louis E., & Co., 1761 Elston Ave., Chicago, Ill.

Goldman, Harvey, & Co., Detroit, Mich.

Miles Machinery Co., Saginaw, Mich.

Ryerson, Joseph T., & Son, Inc., 2558 W. 16th St., Chicago, Ill.

SEPARATORS, CENTRIFUGAL, OIL

National Acme Co., Cleveland, O.

SHAFTING, STEEL

Cumberland Steel Company, Cumberland, Md.

Ryerson, Joseph T., & Son, Inc., 2558 W. 16th St., Chicago, Ill.

Standard Pressed Steel Co., Jenkintown, Pa.

Union Twist Drill Co., Athol, Mass.

SHAFTING, STEEL TUBING FOR NATIONAL TUBE CO. (U.S. Steel Corp. Sub.) Pittsburgh, Pa.**SHAFTS, TURNED AND GROUND**

Cumberland Steel Company, Cumberland, Md.

SHAKING DEVICES

Ajax Flexible Coupling Co., Westfield, N. Y.

SHAPERS

Potter & Johnston Machine Co., Pawtucket, R. I.

Rockford Machine Tool Co., 2412 Kishwaukee Road, Rockford, Ill.

Ryerson, Joseph T., & Son, Inc., 2558 W. 16th St., Chicago, Ill.

Springfield Mch. Tool Co., 631 South-ern Ave., Springfield, O.

SHAPERS, VERTICAL

Hanson-Whitney Mch. Co., Hartford, Conn.

Pratt & Whitney Co., Hartford, Conn.

SHAPES, STRUCTURAL

Carnegie-Illinois Steel Corp., (U.S. Steel Corp. Sub.) Pittsburgh, Pa.

SHEARING MACHINERY

Armstrong-Blum Mfg. Co., 343 N. Francisco Ave., Chicago.

Buffalo Forge Co., Buffalo, New York.

Consolidated Machine Tool Corporation, Rochester, N. Y.

Morgan Engineering Co., Alliance, O.

Niagara Mch. & Tool Wks., Buffalo.

Ryerson, Joseph T., & Son, Inc., 2558 W. 16th St., Chicago, Ill.

Schatz Mfg. Co., Poughkeepsie, N. Y.

SHEARS, ROTARY

Bliss, E. W., Co., Toledo, O.

Niagara Mch. & Tool Wks., Buffalo.

Ryerson, Joseph T., & Son, Inc., 2558 W. 16th St., Chicago, Ill.

Schatz Mfg. Co., Poughkeepsie, N. Y.

Union Twist Drill Co., Athol, Mass.

SHEARS, SQUARING

Niagara Mch. & Tool Wks., Buffalo.

Schatz Mfg. Co., Poughkeepsie, N. Y.

SHEAVE WHEELS

Link-Belt Co., Chicago.

Wood's, T. B., Sons Co., Chambersburg, Pa.

SHERARDIZING, ELECTRIC

General Electric Co., Schenectady, N. Y.

SHEET METALS

American Sheet & Tin Plate Co., (U.S. Steel Corp. Sub.) Pittsburgh, Pa.

New Jersey Zinc Co., 160 Front St., New York City.

Ryerson, Joseph T., & Son, Inc., 2558 W. 16th St., Chicago, Ill.

SHEETS, IRON AND STEEL

Ryerson, Joseph T., & Son, Inc., 2558 W. 16th St., Chicago, Ill.

SLEEVES

Cleveland Twist Drill Co., Cleveland, O.

Morse Twist Drill & Machine Co., New Bedford, Mass.

National Twist Drill & Tool Co., Detroit, Mich.

Pratt & Whitney Co., Hartford, Conn.

Standard Tool Co., Cleveland, O.

Union Twist Drill Co., Athol, Mass.

SLIDE RULES

Pease, C. F., Co., 822 No. Franklin St., Chicago.

SLOTTING MACHINES

Baker Brothers, Inc., Toledo, O.

Consolidated Machine Tool Corporation, Rochester, N. Y.

Nazel Engineering & Machine Wks., Philadelphia, Pa.

SLOTTING MACHINES, AUTOMATIC SCREW

Waterbury Farrel Fdry. & Mch. Co., Waterbury, Conn.

SOCKETS

Cleveland Twist Drill Co., Cleveland, O.

Morse Twist Drill & Machine Co., New Bedford, Mass.

National Twist Drill & Tool Co., Detroit, Mich.

Pratt & Whitney Co., Hartford, Conn.

Standard Tool Co., Cleveland, O.

Union Twist Drill Co., Athol, Mass.

Whitney Mfg. Co., Hartford, Conn.

Williams, J. H., & Co., 75 Spring St., New York City.

SPACING AND BORING EQUIPMENT

Craley, C. C., Mfg. Co., Shillington, Pa.

SPECIAL MACHINERY AND TOOLS

Baird Machine Co., Bridgeport, Conn.

Barnes Drill Co., 514 Chestnut St., Rockford, Ill.

Barnes, W. F., & John Co., Rockford, Ill.

Bilgram Gear & Mch. Works, 1217-35 Spring Garden St., Philadelphia.

Blanchard Machine Co., 64 State St., Cambridge, Mass.

Bliss, E. W., Co., Toledo, O.

Columbus Die, Tool & Machine Co., Columbus, O.

Davis Boring Tool Co., Inc., 6200 Maple Ave., St. Louis, Mo.

Earle Gear & Mch. Co., 4709 Stenton Ave., Philadelphia.

Gisholt Machine Co., Madison, Wis.

Gorton, Geo., Mch. Co., 1109 13th St., Racine, Wis.

Grant Mfg. & Mch. Co., N. W. Station, Bridgeport, Conn.

Greenlee Bros. & Co., Rockford, Ill.

Hannifin Mfg. Co., 621-631 S. Kolmar Ave., Chicago.

Hartford Special Mch. Co., Hartford, Conn.

Ingersoll Milling Mch. Co., Rockford, Ill.

Langelier Mfg. Co., Providence, R. I.

Littell, E. J., Mch. Co., 4125 Ravenswood Ave., Chicago.

Lucas Mch. Tool Co., Cleveland, O.

Manufacturers' Consulting Engineers, Syracuse

CLASSIFIED AND RE-SALE

Rates for Advertisements—\$5.25 Column Inch Each Insertion

High Grade Used and Rebuilt Machine Tools

LATHES

36"x30" Lodge & Shipley Selec. Grd. Hd.
36"x30" L. & S. two carriages, Grd. Hd. S.P.D.
36"x18" American Grd. Hd. S.P.D.
36"x14" Boye & Emmes Cone Head Lathe.
24"x10" Bradford S.P.D. Grd. Hd.
20"x10" American Grd. Hd.
18"x10" Lodge & Shipley Selec. Grd. Hd., S.P.D.
18"x10" Greaves Klusman 3 S.C.D. D.B.G.
18"x8" Greaves Klusman Grd. Hd. Lathe.

RADIALS AND UPRIGHT DRILLS

2 1/2", 3", 3 1/2", 6" Cinti. Bick. S.P.D.
3, 4, 5 & 6" American Triple Purpose, S.P.D.
24" Cincinnati Bickford Upright, Tapping.
No. 40 Natco Straight Line Multiple.

GEAR CUTTERS AND HOBBERS

6", 11" & 18" Gleason Bevel Gear Generators.
No. 1 Schuchardt & Schutte.
18-H Gould & Eberhardt Hobbers.
No. 36BM Gould & Eberhardt 3-sp. Gr. Rougher.
No. 3-36, No. 4-48, No. 6-60 Brown & Sharpe Automatic Gear Cutters, S.P.D.
No. 61, 615, 6 Follows Gear Shapers.

BORING MILLS

52" Gisholt, S.P.D.
42" Bullard New Era.
No. 1 Barrett Horizontal.
No. 2 Barrett Horz.

SHAPERS AND PLANERS

16", 20" & 24" Gould & Eberhardt, high duty.
26x26x8" Cleveland Openside.
42"x42"x10" Cleveland Openside.

MILLING MACHINES

No. 2 Cincinnati High Power, S.P.D.
No. 2 Rockford Univ. Cone.
No. 3 Cincinnati Universal, Cone drive.
No. 3 Cincinnati High Power, Plain, S.P.D.
No. 3 LeBlond H.D. Plain.
No. 3 Kempsmith Universal, Cone.
No. 3A Heavy Brown & Sharpe Univ.
No. 4 Cinti. H.P. Plain, S.P.D.
No. 4 Cincinnati Universal, S.P.D.

GRINDERS

Nos. 50, 55, 60, 65 and 70 Healds.
No. 2 Brown & Sharpe Surface.
No. 2 Diamond Surface, M.D., late type.
16"x48" Landis Crankshaft.
16"x72" Landis Crankshaft.
10"x52" Landis Self Contained.

MISCELLANEOUS

1/2" Dble. Spin. Landis Bolt, Lanco Hds.
Lead Screw, Arr. M.D.
2" Landis Single spindle, Cone drive.
98A Toledo SS Press, Double Crank.

If machines you need are not listed above, send us your inquiry. We have a very large stock.

Cincinnati Machinery & Supply Co.
29 West Second St., Cincinnati, Ohio

MODERN MACHINE TOOLS

TURRET LATHES, MFG. LATHES

No. 4 Warner & Swasey Universal, motor dr. 12 speed head
No. 2A, 3A Warner & Swasey Universal, M.D.
No. 4 Warner & Swasey Universal, cone
No. 4, 6, 8 Warner & Swasey Turret, cone
No. 5A, 6A, 7A Potter & Johnston Auto., S.P.D.
3"x36" Jones & Lamson, 1 spindle geared head
3"x36" Jones & Lamson, 2 spindle geared head
18" 26" Libby Geared Head
14" Fay Automatic, S.P.D.
No. 9, 12 LeBlond Multi-Cut, M.D.
Gisholt Simplicitat, M.D.

GEAR MACHINERY

No. 12 Barber-Colman Gr. Hob., double overarm
No. 3, 4, 5 Brown & Sharpe Gear Cutters
No. 34 Brown & Sharpe Gear Hobber, M.D.
6", 11" 18" Gleason Straight Tooth Gear Gen.
No. 18H Gould & Eberhardt Gear Hobber
No. 3, 12 Barber-Colman Gr. Hob., single overarm
10" Pratt & Whitney Hydraulic Gear Grinder, three motor drive
Hercules Gear Hobber, belt drive

ENGINE LATHES

14"x6" Lodge & Shipley Selective Head, M.D.
14"x6" Lodge & Shipley, cone
16"x6" Hendey, yoke head
16"x6" Lodge & Shipley Selec. Hd., M.D.
16"x8" American Geared Head, M.D.
16"x8" Lodge & Shipley, cone head
18"x8" Hendey, yoke head
18"x8" Lodge & Shipley, cone head
18—36"x16" Rahn-Larmon Geared Head Sliding Bed Extension Gap, M.D.
19"x10" LeBlond, cone head
20"x8" American, geared head
21"x10" LeBlond Geared Head, taper
26"x10" Monarch, cone head
22"x8" Lodge & Shipley, cone head
24"x8" Monarch, geared head
24"x12" Lodge & Shipley, cone head, taper
25"x12" LeBlond, cone head
27"x12" American, cone head
28—57"x12" Putnam Sliding Bed Extension Gap
30"x12" American Geared Head
36"x18" American, cone head, taper
36"x18" LeBlond, geared head
41"x28" Bridgeford geared head, taper

MILLING MACHINES

No. 2 Milwaukee Universal, motor in base, Timken Bearings, dial feed
No. 3 Milwaukee Universal, motor in base, Timken Bearings, dial feed
No. 2 H.P., 3 H.P., 4 H.P., Cinti Univ., S.P.D.
No. 2A Brown & Sharpe Universal, S.P.D.
No. 1 1/2, 2, 3 Brown & Sharpe Universal, cone
No. 24 Milwaukee Vertical, S.P.D.
No. 4 Cincinnati Vertical, S.P.D.

No. 6 Reed-Prentice Vert., M.D., improved type
No. 4B Becker Vertical, M.D.
No. 2M, 2, 3, 4, 5 Cincinnati Plain, S.P.D.
No. 2B, 3B Milwaukee Pl., M.D., dbl. overarm
No. 1 Milwaukee Plain, single overarm
No. 4B Heavy, 5B Heavy Brown & Sharpe Plain, M.D., P.R.T.
No. 1 1/2, 2, 3, 4 Cincinnati Plain, cone
No. 1 1/2, 2, 3 Brown & Sharpe Plain, cone
No. 13B Brown & Sharpe Plain, Nat. Standard
48" Osterlein Tilted Offset, M.D., brand new, latest
24" Cincinnati Pl. Auto., M.D., Nat. Standard
18" 24" Cincinnati Duplex Automatic, M.D.
48" Cincinnati Plain Automatic, worm dr., M.D.
48" Cincinnati Plain Automatic, spur dr., M.D.
C68A Newton 3 spindle Continuous, M.D.

PRESSES

No. 268 1/4 Toledo Toggle
No. 6 Toledo O.B.I.
No. 3 Michigan O.B.I.
No. 1 1/2 Bliss Cam
D2, D12 Ferracute Drawing
P2, P3, P4 Ferracute Stiles Type
No. 5 Bliss Stiles
No. 6 Waterbury-Farrel D.C.
No. 32P, 35 Toledo Stiles
S51 Ferracute Double Crank
No. 54A Toledo Special
No. 65 Consolidated S.S.
No. 166 Toledo Toggle Drawing
No. 24 Buffalo Armor Plate Slitting Shear

GRINDERS

No. 50, 55, 60, 65 Heald Cylinder
No. 70 Heald Internal
No. 3 Rivett Internal
No. 2, 3 Brown & Sharpe Surface
No. 2 Diamond Surface
No. 2, 3 Wilmarth & Morman Auto. Surface
No. 78 Wilmarth & Morman Sur., M.D. in base
No. 25 Heald Rotary Sur., M.D., hydraulic feed
14" Pratt & Whitney Vertical Surface
18"x48" Diamond Light Duty Face, M.D.
60" Bridgeport Face
60" Springfield Face
No. 1 LeBlond Universal Tool
No. 1 Norton Universal Tool
No. 1 1/2 Cincinnati Universal Tool
No. 2 Osterlein Universal Tool
No. 31, 41 Oliver Drill Pointers, M.D. in base
No. 3 Brown & Sharpe Universal
No. 4 Landis Universal
6x18", 10x24", 10x30", 10x36", 10x52", 10x72", 12x56", 12x52", 12x72", 12x120", 16x32", 16x52", 16x72", Landis Plain Self-Contained Cylindrical Grinders, M.D.
No. 14 Brown & Sharpe Plain Cylindrical
10"x72" Norton Plain Cylindrical
No. 4 Gardner B.B. Disc
No. 24—53" Gardner Horizontal Disc, M.D.
No. 120 Gardner Combination Disc

Write for complete Stock List.

THE EASTERN MACHINERY CO. 3267 SPRING GROVE AVE. CINCINNATI, OHIO

A NEW BOOK ON DIE-CASTING

See
Pages
84-85.

UNUSUAL TOOLS

PLANER, Openside 48"x48"x10" Liberty, M.D., 2 rail heads, 1 side head
PLANER, Openside 30"x30"x10" Liberty, M.D., 1 rail head, 1 side head
SHEARS, 10', 1/4"-3/4" Pittsburgh, M.D. (2)
SLOTTERS, 16" & 18" & 20" Sellers & Betts, M.D.
DRILL, RADIAL, 4' American, motor on arm.

AND A COMPLETE STOCK OF UP-TO-DATE REBUILT EQUIPMENT.

HARVEY GOLDMAN & CO.
Machinery

10567 Gratiot Ave., Detroit, Mich.

WANTED

A-1 Tool and Die Maker
between thirty and forty years old, capable of taking complete charge of a small shop in a town of about ten to fifteen thousand, willing to invest some money. Must be able to handle men and do estimating. Box 150, care MACHINERY, 148 Lafayette St., New York City.

PRODUCTION TOOLS

AUTOMATIC, 14" Fay
BROACH, No. 3 Oilgear hydraulic
DIAMOND BORER, 2 spdl. Coulter
GRINDER, CENTERLESS, No. 2 Cinti.
GRINDER, PLAIN, 10"x36" Norton
LATHE, TURRET, 24" Bullard
LATHE, TURRET, Nos. 4, 6 & 3A W & S
MILLER, ROTARY, 24", 36" & 48" Newton
MILLER, MFG. Nos. 1 1/2A & 2 Milwaukee
MILLER, DUPLEX, 24" & 48" Cinti.
MILLER, 48" Ohio tilted offset
PRESS, 250 & 400 T. Toledo coining
THREADERS, 1 1/2" & 2" Landis 2 spdl.
WELDER, SPOT, 100 amp. Thompson Gibb

1500 Tools in Stock. Send for List.

MILES MACHINERY CO.
Saginaw, Westside, Mich.

DIAMONDS

MOUNTED TO SUIT REQUIREMENTS (use 1 Karat to Each 7 in. diam. of wheel)
Prices: 1K, \$12; 1 1/2 K, \$20; 2K, \$30; 2 1/2 K, \$50; 3K, \$60; 3 1/2 K, \$75; 4K, \$85; Resol. 75cents. Credit allowed for old diamonds.

DIAMOND TOOL CO., Est. 1860
4059 S. ELLIS AVE., CHICAGO, ILL.
FRICK BLDG., PITTSBURGH, PA.
Service agents wanted in Industrial Centers
Write Chicago office

Morse Chain Co., Ithaca, N. Y.
Philadelphia Gear Works, Philadelphia.
Whitney Chain & Mfg. Co., Hartford, Conn.

STAMPINGS, SHEET METAL
New Britain-Gridley Mch. Co., New Britain, Ct.

STAMPS, STEEL AND MARKING DIES
Colonial Broach Co., Detroit, Mich.
Numeral Stamp & Tool Co., Inc., Staten Island, New York.
Pittsburgh Stamp Co., Inc., Pittsburgh, Pa.

STEEL
Carpenter Steel Co., Reading, Pa.
Ryerson, Joseph T. & Son, Inc., 2558 W. 16th St., Chicago, Ill.
Timken Roller Bearing Co., Canton, O.
Vanadium Alloys Steel Co., Latrobe, Pa.

STEEL ALLOYS
See Alloys, Steel Tungsten, etc.

STEEL BARS
See Bars, Steel.

STEEL, COLD DRAWN
Ryerson, Joseph T. & Son, Inc., 2558 W. 16th St., Chicago, Ill.
Union Drawn Steel Co., Massillon, O.

STEEL, HIGH SPEED TOOL
Armstrong Bros. Tool Co., 313 N. Francisco Ave., Chicago.
Carpenter Steel Co., Reading, Pa.
Ryerson, Joseph T. & Son, Inc., 2558 W. 16th St., Chicago, Ill.
Vanadium Alloys Steel Co., Latrobe, Pa.

STEEL, MACHINE
Carpenter Steel Co., Reading, Pa.
Ryerson, Joseph T. & Son, Inc., 2558 W. 16th St., Chicago, Ill.
Timken Roller Bearing Co., Canton, O.
Union Drawn Steel Co., Massillon, O.
Vanadium Alloys Steel Co., Latrobe, Pa.

STEEL, RUSTLESS
Carpenter Steel Co., Reading, Pa.

STEEL, STAINLESS
Carpenter Steel Co., Reading, Pa.
Ryerson, Joseph T. & Son, Inc., 2558 W. 16th St., Chicago, Ill.

STEEL, STRIP AND SHEET
American Sheet & Tin Plate Co., (U.S. Steel Corp. Sub.) Pittsburgh, Pa.
Roebbling's, John A., Sons Co., Trenton, N. J.
Ryerson, Joseph T. & Son, Inc., 2558 W. 16th St., Chicago, Ill.

STELLITE
Haynes Stellite Co., Kokomo, Ind.

STOCKS, DIE
Card, S. W., Mfg. Co., Mansfield, Mass.
Greenfield Tap & Die Corp., Greenfield, Mass.

Morse Twist Drill & Machine Co., New Bedford, Mass.
Pratt & Whitney Co., Hartford, Conn.

STONES, OIL
Carborundum Co., Niagara Falls, N. Y.
Norton-Pike Co., Div. Norton Co., Littleton, N. H.

STRAIGHTENING MACHINERY
Morse Twist Drill & Machine Co., New Bedford, Mass.
Oilgear Co., Milwaukee, Wis.
Schatz Mfg. Co., Poughkeepsie, N. Y.
Springfield Mch. Tool Co., 631 Southern Ave., Springfield, O.

STUD SETTERS
Errington Mechanical Laboratory, 200 Broadway, New York.
Geometric Tool Co., New Haven, Conn.

SUB PRESSES
U. S. Tool Co., Inc., Ampere, N. J.

SWAGING MACHINES
Langelier Mfg. Co., Providence, R. I.
Torrington Co., Torrington, Conn.

SWITCHES
Allen-Bradley Co., 1331 S. First St., Milwaukee, Wis.
General Electric Co., Schenectady, N. Y.
Production Instrument Co., 1321 So. Wabash Ave., Chicago.
Shepard Niles Crane & Hoist Corp., 444 Schuyler Ave., Montour Falls, N. Y.

TABLET PRESSES
Kux-Lohner Machine Co., 2145-47 Lexington St., Chicago.

TACHOMETERS
Leeds & Northrup Co., Philadelphia.
Scherr, Geo. Co., 128 Lafayette St., New York City.

TAP EXTENSIONS
Allen Mfg. Co., 125 Shelton St., Hartford, Conn.

TAP EXTRACTORS
Walton Co., Hartford, Conn.

TAP HOLDERS
Errington Mechanical Laboratory, 200 Broadway, New York.
McCrosky Tool Corp., Meadville, Pa.
National Automatic Tool Co., Richmond, Ind.
Procurier Safety Chuck Co., 20 S. Clinton St., Chicago, Ill.

TAPPING ATTACHMENTS AND DEVICES
Baker Brothers, Inc., Toledo, O.
Barber-Colman Co., Rockford, Ill.

Buhr Machine Tool Co., Ann Arbor, Mich.
Consolidated Mch. Tool Corp. of America, Rochester, N. Y.
Errington Mechanical Laboratory, 200 Broadway, New York.
Geometric Tool Co., New Haven, Conn.
Haskins, R. G., Co., 4634 Fulton St., Chicago.

Langelier Mfg. Co., Providence, R. I.
Leland-Gifford Co., Worcester, Mass.
McCrosky Tool Corp., Meadville, Pa.
National Automatic Tool Co., Richmond, Ind.
Procurier Safety Chuck Co., 20 S. Clinton St., Chicago, Ill.

TAPPING MACHINES
Acme Machinery Co., Cleveland.
Armstrong-Blum Mfg. Co., 343 N. Francisco Ave., Chicago.
Baker Brothers, Inc., Toledo, O.
Barnes Drill Co., 814 Chestnut St., Rockford, Ill.

Barnes, W. F., & John Co., Rockford, Ill.
Brown & Sharpe Mfg. Co., Providence, Mich.
Buhr Machine Tool Co., Ann Arbor, Mich.

Frew Machine Co., Philadelphia, Pa.
Geometric Tool Co., New Haven, Conn.
Greenlee Bros. & Co., Rockford, Ill.
Haskins, R. G., Co., 4634 Fulton St., Chicago.

Langelier Mfg. Co., Providence, R. I.
Leland-Gifford Co., Worcester, Mass.
Murphy Mch. & Tool Co., 951 Porter St., Detroit.

National Automatic Tool Co., Richmond, Ind.
Procurier Safety Chuck Co., 20 S. Clinton St., Chicago, Ill.
Rockford Drilling Mch. Co., Rockford, Ill.

TAPS
Bath, John, & Co., Inc., Worcester, Mass.
Card, S. W., Mfg. Co., Mansfield, Mass.

Ex-Cell-O Aircraft & Tool Corp., Detroit, Mich.
Geometric Tool Co., New Haven, Conn.
Greenfield Tap & Die Corp., Greenfield, Mass.

Hanson-Whitney Mch. Co., Hartford, Ct.
Hardings Brothers, Inc., Elmira, N. Y.
Landis Mch. Co., Inc., Waynesboro, Pa.
Morse Twist Drill & Machine Co., New Bedford, Mass.

Murphy Mch. & Tool Co., 951 Porter St., Detroit.

National Acme Co., Cleveland, O.
Pratt & Whitney Co., Hartford, Conn.
Standard Tool Co., Cleveland, O.

TAPS, COLLAPSING
Errington Mechanical Laboratory, 200 Broadway, New York.
Geometric Tool Co., New Haven, Conn.
Landis Mch. Co., Inc., Waynesboro, Pa.
Murphy Mch. & Tool Co., 951 Porter St., Detroit.

National Acme Co., Cleveland, O.

THERMOMETERS, INDICATING AND RECORDING
Illinois Testing Laboratory, Inc., 320 N. LaSalle St., Chicago.
Leeds & Northrup Co., Philadelphia.

THREAD CUTTING MACHINES
Acme Machinery Co., Cleveland.
Brown & Sharpe Mfg. Co., Providence.
Eastern Machine Screw Corp., New Haven, Conn.
Fellows Gear Shaper Co., Springfield, Vt.

Geometric Tool Co., New Haven, Conn.
Grant Mfg. & Mch. Co., N. W. Station, Bridgeport, Conn.

Hall Planetary Co., Philadelphia.
H & G Works, Eastern Machine Screw Corp., New Haven, Conn.

Landis Mch. Co., Waynesboro, Pa.
Murphy Mch. & Tool Co., 951 Porter St., Detroit.
Pratt & Whitney Co., Hartford, Conn.
Rivett Lathe & Grinder Inc., Brighton, Boston, Mass.

THREAD CUTTING TOOLS
Armstrong Bros. Tool Co., 313 N. Francisco Ave., Chicago.
Eastern Machine Screw Corp., New Haven, Conn.

H & G Works, Eastern Machine Screw Corp., New Haven, Conn.
Ready Tool Co., Bridgeport, Conn.

Rivett Lathe & Grinder Inc., Brighton, Boston, Mass.
Williams, J. H., & Co., 75 Spring St., New York City.

THREAD GAGES
See Gages, Thread.

THREAD MILLING MACHINES
Hall Planetary Co., Philadelphia.
Hanson-Whitney Mch. Co., Hartford, Conn.
Pratt & Whitney Co., Hartford, Conn.

Scherr, Geo. Co., 128 Lafayette St., New York City.
Waltham Mch. Wks., Waltham, Mass.

THREAD ROLLING MACHINES
V & O Press Co., Hudson, N. Y.
Waterbury Farrel Fdry. & Mch. Co., Waterbury, Conn.

TIN AND TERNE PLATES
American Sheet & Tin Plate Co., (U. S. Steel Corp. Sub.) Pittsburgh, Pa.

TOOL BITS, HIGH SPEED STEEL

Armstrong Bros. Tool Co., 313 N. Francisco Ave., Chicago.
Barber-Colman Co., Rockford, Ill.
Carpenter Steel Co., Reading, Pa.
Ryerson, Joseph T. & Son, Inc., 2558 W. 16th St., Chicago, Ill.
Vanadium Alloys Steel Co., Latrobe, Pa.
Williams, J. H., & Co., 75 Spring St., New York City.

TOOL HEADS, ADJUSTABLE
Criley, C. C., Mfg. Co., Shillington, Pa.
Precision Tool Co., Bridgeport, Conn.
R and L Tools, Nicetown, Philadelphia, Pa.

TOOL HOLDERS
Armstrong Bros. Tool Co., 313 N. Francisco Ave., Chicago.

Cleveland Twist Drill Co., Cleveland, O.
Gisholt Machine Co., Madison, Wis.
Lovejoy Tool Co., Inc., Springfield, Vt.
Michigan Tool Co., Detroit, Mich.
R and L Tools, Nicetown, Philadelphia, Pa.

Ready Tool Co., Bridgeport, Conn.
Williams, J. H., & Co., 75 Spring St., New York City.

TOOL STEEL
Carpenter Steel Co., Reading, Pa.
Ryerson, Joseph T. & Son, Inc., 2558 W. 16th St., Chicago, Ill.

TOOLS, LATHE, SHAPER AND PLANER

Armstrong Bros. Tool Co., 313 N. Francisco Ave., Chicago.
Carboly Co., Inc., Detroit, Mich.

Gisholt Machine Co., Madison, Wis.
Lovejoy Tool Co., Springfield, Vt.
Michigan Tool Co., Detroit, Mich.
R and L Tools, Nicetown, Philadelphia, Pa.

Ready Tool Co., Bridgeport, Conn.
Williams, J. H., & Co., 75 Spring St., New York City.

TOOLS, RECUT RECLAIMED
Chicago Tool Reclaiming Co., 147 W. Austin Ave., Chicago.

TRANSMISSION MACHINERY
See Hangers, Shafting, Pulleys, Clutches, Couplings, Belting, Chains, etc.

TRANSMISSION, VARIABLE SPEED
Link-Belt Co., Chicago.
New Departure Mfg. Co., Bristol, Conn.

Oilgear Co., Milwaukee, Wis.
Reeves Pulley Co., Columbus, Ind.

TUBE FLANGING MACHINES
Grant Mfg. & Mch. Co., N. W. Station, Bridgeport, Conn.

TUBING, STAINLESS STEEL

National Tube Co., (U.S. Steel Corp. Sub.) Pittsburgh, Pa.

TUBING STEEL AND SEAMLESS STEEL
National Tube Co., (U.S. Steel Corp. Sub.) Pittsburgh, Pa.

Ryerson, Joseph T. & Son, Inc., 2558 W. 16th St., Chicago, Ill.
Timken Roller Bearing Co., Canton, O.

TUMBLING BARRELS

Baird Machine Co., Bridgeport, Conn.

TUNGSTEN CARBIDE

Carboly Co., Inc., Detroit, Mich.
Turret Lathes, Vertical

Bullard Co., Bridgeport, Conn.

TWIST DRILLS

See Drills, Twist.

UNIVERSAL JOINTS

Boston Gear Works, Inc., North Quincy, Mass.

VALVES, AIR

C. B. Hunt & Son, Salem, Ohio.

VALVES, HYDRAULIC

Elmes, Chas. F., Engineering Works, 222 N. Morgan St., Chicago.

Hannifin Mfg. Co., 621-631 S. Kolmar Ave., Chicago.

C. B. Hunt & Son, Salem, Ohio.

Oilgear Co., Milwaukee, Wis.

V-BELTS

Allis-Chalmers Mfg. Co., Milwaukee, Wis.

Manhattan Rubber Mfg. Div. Raybestos-Manhattan, Inc., Passaic, N. J.

Wood's, T. B., Sons Co., Chambersburg, Pa.

Worthington Pump & Mchry. Corp., Harrison, N. J.

VICES, BENCH

Desmond-Stephan Mfg. Co., Urbana, O.

New Britain-Gridley Mch. Co., New Britain, Ct.

VICES, MACHINE

Armstrong-Blum Mfg. Co., 343 N. Francisco Ave., Chicago.

Armstrong Bros. Tool Co., 313 N. Francisco Ave., Chicago.
Barber-Colman Co., Rockford, Ill.
Brown & Sharpe Mfg. Co., Providence.
Graham Mfg. Co., Providence, R. I.
LeBlond, H. K., Mch. Tool Co., Cincinnati, O.
Purvis, Edw., & Son, 110 York St., Brooklyn, N. Y.
Skinner Chuck Co., New Britain, Conn.
Whitney Chain & Mfg. Co., Hartford, Conn.

VICES, PIPE
Greenfield Tap & Die Corp., Greenfield, Mass.
Williams, J. H., & Co., 75 Spring St., New York City.

VICES, PLANER AND SHAPER
Cincinnati Planer Co., Cincinnati, O.
Graham Mfg. Co., Providence, R. I.
Skinner Chuck Co., New Britain, Conn.

VOLTMETERS

General Electric Co., Schenectady, N. Y.

WASHERS

Boston Gear Works, Inc., North Quincy, Mass.

Felters Co., Boston, Mass.

WASHERS, LOCK

Columbia Nut & Bolt Co., Inc., Bridgeport, Conn.

WASTE AND WIPING CLOTHS, RECLAIMERS

Oakite Products, Inc., 26 Thames St., New York City.

WELDING AND CUTTING GASES

Linde Air Products Co., 30 E. 42nd St., New York.

WELDING EQUIPMENT

Harnischfeger Corp., Milwaukee, Wis.

WELDING EQUIPMENT, ELECTRIC ARC

General Electric Co., Schenectady, N. Y.

Lincoln Electric Co., Cleveland.

Ryerson, Joseph T. & Son, Inc., 2558 W. 16th St., Chicago, Ill.

WHEELS, STEEL, R.R. AND INDUSTRIAL

Carnegie-Illinois Steel Corp., (U.S. Steel Corp. Sub.) Pittsburgh, Pa.

WIRE, FLAT AND ROPE

Roebbling's, John A., Sons Co., Trenton, N. J.

Ryerson, Joseph T. & Son, Inc., 2558 W. 16th St., Chicago, Ill.

WIRE NAIL MACHINERY

Ryerson, Joseph T. & Son, Inc., 2558 W. 16th St., Chicago, Ill.

WIRE WORKING MACHINERY

Baird Machine Co., Bridgeport, Conn.

WOODWORKING MACHINERY

Barnes, W. F., & John Co., Rockford, Ill.

New Britain-Gridley Mch. Co., New Britain, Ct.

Seneca Falls Mch. Co., Seneca Falls, N. Y.

Sidney Machine Tool Co., Sidney, O.

WORM DRIVES

Michigan Tool Co., Detroit, Mich.

WRENCHES

Armstrong Bros. Tool Co., 313 N. Francisco Ave., Chicago.

Greene, Tweed & Co., 109 Duane St., New York City.

Standard Tool Co., Cleveland, O.

Williams, J. H., & Co., 75 Spring St., New York City.

WRENCHES, PIPE

Greene, Tweed & Co., 109 Duane St., New York City.

Greenfield Tap & Die Corp., Greenfield, Mass.

Starratt, L. S., Co., Athol, Mass.

Williams, J. H., & Co., 75 Spring St., New York City.

WRENCHES, RATCHET

Greene, Tweed & Co., 109 Duane St., New York City.

Williams, J. H., & Co., 75 Spring St., New York City.

WRENCHES, TAP

Card, S. W., Mfg. Co., Mansfield, Mass.

Greenfield Tap & Die Corp., Greenfield, Mass.

Morse Twist Drill & Machine Co., New Bedford, Mass.

Pratt & Whitney Co., Hartford, Conn.

Starratt, L. S., Co., Athol, Mass.

ZINC

New Jersey Zinc Co., 160 Front St., New York City.

Ryerson, Joseph T. & Son, Inc., 2558 W. 16th St., Chicago, Ill.

DRILL THESE HOLES



by a Quick, Easy, Inexpensive Method.

Your business letterhead will bring literature

Watts Bros. Tool Works WILMERDING, PA.

ALLEN



Seven different test operations testify to the toughness and strength of the Allen screws you use. But none of these tests, nor any other, equals the tricky tests of USE which Allen screws have survived for 26 years. . . The test of *USE* — in users' hands — has made these screws the most widely used of any hollow screws, by a wide margin.

THE ALLEN MFG. COMPANY • HARTFORD, CONN. U. S. A.

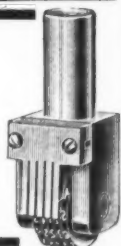
***Do You Get Your Share Now
England is Buying Machine Tools?***

Principal of established and successful sales organization, headquarters London, is visiting United States in August.

Contact him through Box 149, care MACHINERY, 148 Lafayette Street, New York City.

→ **Save Time!**
→ **Save Money!**
→ **Speed Marking!**
with a NUMBERALL

Write for latest literature and prices
NUMBERALL STAMP & TOOL CO., Inc.
HUGUENOT PARK, STATEN ISLAND, N. Y.

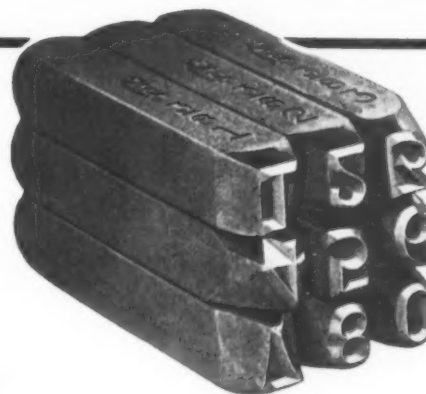


A NEW BOOK ON DIE-CASTING

See Pages 84-85.

**MORE
MARKS
PER
DOLLAR**
with

Thor



"The Stamp with a Blue Head"

Special high carbon vanadium alloy steel individually heat treated to correct temper in both face and shank; heads individually turned down to give a centrally located striking point; uniform characters—hand engraved; uniform size and length; size and character plainly marked on the "Thumb Side" to avoid delay and danger of error in use.

Thor Stamps are built to give more and better marks per dollar. The catalog tells more about how they are made—why it pays to use them. Send for a copy.

THE PITTSBURGH STAMP CO.
810 CANAL ST. **PITTSBURGH, PA.**

ALPHABETICAL INDEX OF ADVERTISERS

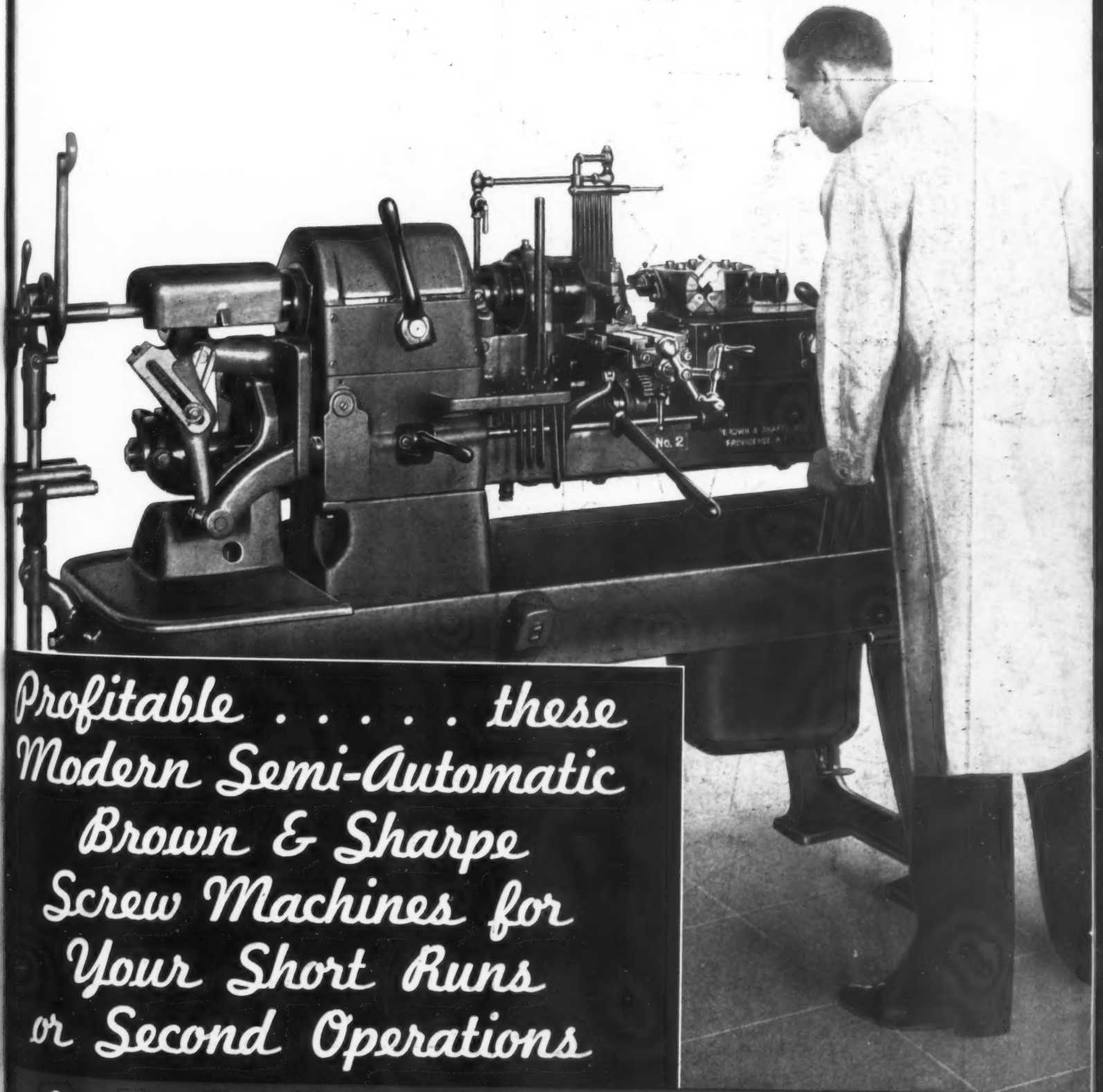
A		G		O	
Abrasive Machine Tool Co.	88	Gallmeyer & Livingston Co.	88	Oakite Products, Inc.	122
Acme Machine Tool Co.	94	Gammans-Holman Co.	127	Oilgear Co.	116
Acme Machinery Co.	97	Ganschow Gear Co.	106	Oliver Instrument Co.	87
Ajax Flexible Coupling Co.	109	General Electric Vapor Lamp Co.	62	P	
Allen-Bradley Co.	Back Cover	Geometric Tool Co.	41	Parker-Kalon Corp.	32
Allen Mfg. Co.	133	Gisholt Machine Co.	39	Perkins Mch. & Gear Co.	104
Allis-Chalmers Mfg. Co.	33	Gits Bros. Mfg. Co.	101	Philadelphia Gear Works	105
American Gas Furnace Co.	111	Goldman, Harvey & Co.	131	Pittsburgh Stamp Co.	133
American Metal Treatment Co.	111	Gorton, George, Machine Co.	90	Poole Foundry & Machine Co.	108
American Sheet & Tin Plate Co.	78	Goss & de Leeuw Mch. Co.	97	Porter-Cable Machine Co.	94
Ames, B. C., Co.	121	Graham Mfg. Co.	111	Potter & Johnston Machine Co.	94
Arguto Oilless Bearing Co.	108	Grant Gear Works	108	Pratt & Whitney Division Niles-Bement-Pond Co.	14-15
Armstrong-Blum Mfg. Co.	101	Grant Mfg. & Machine Co.	98	Precision Tool Co.	119
Armstrong Bros. Tool Co.	119	Greene, Tweed & Co.	127	Preis Engraving Mch. Co.	97
Atlas Press Co.	95	Greenfield Tap & Die Corp.	Inside Front Cover	Procurier Safety Chuck Co.	123
B		Greenlee Bros. & Co.	Insert preceding page 75	Production Machine Co.	88
Baird Machine Co.	97	Gwilliam Co.	109	Purvis, Edw., & Son	110
Bakelite Corp.	81	H		R	
Baker Brothers, Inc.	42	Hall Planetary Co.	89	R and L Tools	43
Bantam Ball Bearing Co.	109	Hamilton Mfg. Co.	90	Racine Tool & Machine Co.	98
Barber-Colman Co.	Insert preceding page 75	Hanchett Mfg. Co.	88	Ready Tool Co.	119
Barnes Drill Co.	Insert preceding page 75	Hannifin Mfg. Co.	23	Reed-Prentice Corp.	13
Barnes, W. F., & John, Co.	Insert preceding page 75	Hardinge Brothers, Inc.	19-53	Reeves Pulley Co.	12
Baumbach, E. A., Mfg. Co.	98	Harnischfeger Corp.	114	Rivett Lathe & Grinder, Inc.	94
Bausch & Lomb Optical Co.	117	Hartford Special Machinery Co.	106	Rockford Drilling Machine Co.	Insert preceding page 75
Bennett Metal Treating Co.	111	Haynes Stellite Co.	59	Rockford Machine Tool Co.	Insert preceding page 75
Bilgram Gear & Mch. Wks.	104	Herbert, Alfred, Ltd.	99	Roebbling's, John A., Sons Co.	86
Blanchard Machine Co.	52	Hoover Ball & Bearing Co.	67	Rowbottom Machine Co.	91
Boston Gear Works, Inc.	107	Hunt, C. B., & Son	91	Russell Electric Co.	121
Boye & Emmes Mch. Tool Co.	94	Hyatt Roller Bearing Co.	56	Ruthman Machinery Co.	100
Brown & Sharpe Mfg. Co.	Front Cover 65-100	I		Ryerson, Joseph T., & Son, Inc.	77
Bryant Chucking Grinder Co.	26	Illinois Testing Laboratories, Inc.	121	S	
Buffalo Forge Co.	30	Illinois Tool Works	90	S K F Industries, Inc.	36
Buhr Machine Tool Co.	92	Industrial Press	84-85-102-103-125	Schatz Manufacturing Co.	48
C		International Nickel Co., Inc.	75	Scherr, George, Co.	121
Carboloy Co., Inc.	34	J		Seneca Falls Machine Co.	92
Carborundum Co.	58	Jones & Lamson Machine Co.	8-9-123	Shafer Bearing Corp.	27
Card, S. W., Mfg. Co.	111	K		Shepard Niles Crane & Hoist Corp.	110
Carlton Machine Tool Co.	92	Kershaw, F. A.	124	Shore Instrument & Mfg. Co.	121
Carnegie-Illinois Steel Corp.	78	Kingsbury Mch. Tool Corp.	92	South Bend Lathe Works	95
Carpenter Steel Co.	82-83	L		Springfield Machine Tool Co.	94
Chicago Tool Reclaiming Co.	119	Landis Machine Co., Inc.	4-5	Stahl Gear & Machine Co.	106
Cincinnati Grinders Inc.	10-11	Landis Tool Co.	16-17	Standard Pressed Steel Co.	124
Cincinnati Lathe & Tool Co.	127	Langelier Manufacturing Co.	98	Standard Tool Co.	28
Cincinnati Machinery & Supply Co.	131	LeBlond, R. K., Mch. Tool Co.	126	Starrett, L. S., Co.	24
Cincinnati Milling Machine Co.	10-11	Leeds & Northrup Co.	64	Stokerunit Corp.	90
Cincinnati Planer Co.	95	Lehmann Machine Co.	93	Strand, N. A., & Co.	91
Classified Advertisements	131	Leiman Bros., Inc.	113	Sundstrand Machine Tool Co.	Insert preceding page 75
Cleereman Mch. Tool Co.	118	Leland Gifford Co.	92	Superior Die Casting Co.	127
Cleveland Twist Drill Co.	31	Lincoln Electric Co.	49	T	
Climax Molybdenum Co.	79	Linde Air Products Co.	21	Taylor-Shantz, Inc.	98
Colton, Arthur, Co.	110	Link-Belt Co.	46	Texas Company	54-55
Columbia Nut & Bolt Co., Inc.	123	Littell, F. J., Machine Co.	97	Torrington Co.	97
Columbus Die, Tool & Machine Co.	127	Lodge & Shipley Machine Tool Co.	2-3	Twin Disc Clutch Co.	101
Cone Automatic Machine Co., Inc.	95	Loshbough-Jordan Tool & Mch. Co.	98	U	
Consolidated Machine Tool Corp.	45	Lovejoy Tool Co., Inc.	113	Union Carbide & Carbon Corp.	21-59
Craley, C. C., Mfg. Co.	110	Lovejoy Tool Works	108	Union Twist Drill Co.	20-111
Crofoot, Chas. E., Gear Corp.	108	Lucas Machine Tool Co.	91	U. S. Steel Corp. Subsidiaries	78
Cullman Wheel Co.	108	M		U. S. Tool Company, Inc.	99
Cumberland Steel Co.	80	Machinery	84-85-102-103-125	Universal Boring Machine Co.	94
D		Madison-Kipp Corp.	29	Universal Engineering Co.	119-109
Davis Keyseater Co.	91	Madison Mfg. Co.	111	Used Machinery	131
Delta Mfg. Co.	92	Manufacturers' Consulting Engineers	109	V	
Desmond-Stephan Mfg. Co.	88	Massachusetts Gear & Tool Co.	106	V & O Press Co.	129
Diamond Machine Co.	88	Materials Section	75-86	Vanadium-Alloys Steel Co.	76
Diamond Tool Co.	131	Mattison Machine Wks.	Insert preceding page 75	Van Norman Machine Tool Co.	37
Dieffendorf Gear Corp.	106	McCrosky Tool Corp.	Inside Back Cover	Viking Pump Co.	100
E		McGonegal Mfg. Co.	88	W	
Earle Gear & Machine Co.	106	Merrell Manufacturing Co.	99	Walker, O. S., Co., Inc.	92
Eastern Machine Screw Corp.	119	Miles Machinery Co.	131	Walls Sales Corp.	88
Eastern Machinery Co.	131	Modern Machine Corp.	113	Waltham Machine Works	98
Elmes, Charles F., Engineering Wks.	97	Moline Tool Co.	92	Walton Company	111
Errington Mechanical Laboratory	123	Morgan Engineering Co.	110	Warner & Swasey Co.	63
Ex-Cell-O Aircraft & Tool Corp.	57	Morrison Machine Products, Inc.	53	Waterbury Farrel Foundry & Mch. Co.	61
F		Morse Twist Drill & Machine Co.	60	Waterbury Steel Ball Co., Inc.	108
Fafnir Bearing Co.	44	Mummert-Dixon Co.	110	Watts Bros. Tool Works	132
Fairbanks-Morse & Co.	35	Murchey Machine & Tool Co.	119	Westcott Chuck Co.	123
Federal Bearings Co., Inc.	22	N		White, S. S., Dental Mfg. Co.	38
Federal Products Corp.	47	National Automatic Tool Co.	25	Wiesman Mfg. Co.	99
Fellows Gear Shaper Co.	6-7	National Twist Drill & Tool Co.	113	Williams, J. H., & Co.	115
Felters Co., Inc.	99	Nazel Engineering & Mch. Wks.	99	Z	
Foot-Burt Company	40	New Departure Mfg. Co.	18	Zeh & Hahnemann Co.	99
Ford Chain Block Co.	110	Niagara Machine & Tool Works	96		
Ford Motor Co. (Johansson Division)	121	Nice Ball Bearing Co.	109		
Frew Machine Co.	90	Norma-Hoffmann Bearings Corp.	113		
		Norton Company	50-51		
		Numberall Stamp & Tool Co., Inc.	133		

AUGUST 1936—FORTY-SECOND YEAR

AUG 3 1936

MACHINERY

THE INDUSTRIAL PRESS Publishers, 140-148 LAFAYETTE ST., NEW YORK



*Profitable these
Modern Semi-Automatic
Brown & Sharpe
Screw Machines for
Your Short Runs
or Second Operations*

See Page 65

B&S

MAXI-FACTS



By Stoddard

Larry Stoddard, covering Ohio, reports a most amazing record hung up by a "Maxi" High Speed "Gun" Tap. It has tapped over 1200 holes in seamless steel tubing without being sharpened. Previous record 80.



Maxi *they're Black* Tools

VERSATILE

No "one job" taps are "Maxi" High Speed Taps! The special surface treatment that is the secret of their amazing production performances can be applied to "Gun" taps, as in this instance, to nut taps, machine screw taps, or what have you.

"Maxi" High Speed Taps are consistent record breakers, particularly in tough, stringy or abrasive materials. They are easy to identify too, for whatever the type of tap or other tool, if it has the "Maxi" surface treatment, it will be jet black. Ask your distributor for details.

GREENFIELD TAP & DIE CORPORATION

GREENFIELD, MASSACHUSETTS

Detroit Plant: 2102 West Fort Street

Warehouses in New York and Chicago

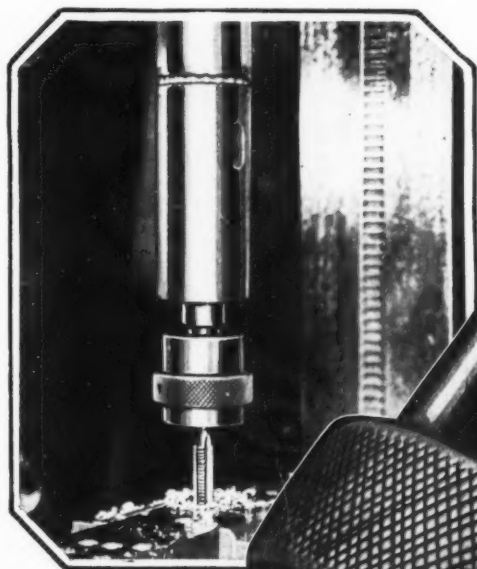
In Canada: Greenfield Tap & Die Corp. of Canada, Ltd., Galt, Ont.

GREENFIELD

WIZARD Friction-Drive Tap Holders

Safety First for Taps

When WIZARD Safety Tap Holders are on the job, the operator does not have to feel his way. He can safely tap through or blind holes at drilling speed because the simple and sure WIZARD friction prevents tap breakage. Three sizes of holders handle hand taps from 3/16" to 1-1/4". They all speed up machine tapping.



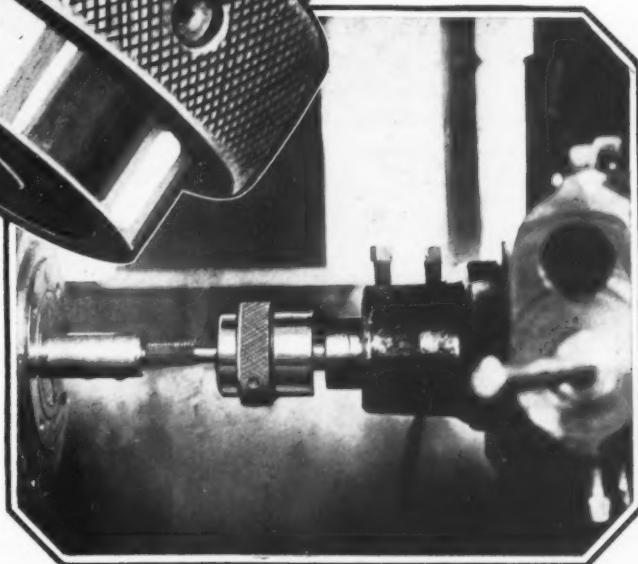
Short Overhang

Above: WIZARD Tap Holder in drill press spindle. Note short overhang below spindle end. The tap is held in a bushing that floats in the holder. It is entirely contained in the holder.

A new McCrosky
WIZARD Bulletin
No. 15-D
gives complete
details. Send
for a copy

Easy Adjustment

Below: WIZARD Tap Holder in turret of turret lathe. Friction is adjusted to suit tap by turning knurled collar which effects a powerful differential action, permitting adjustment without removing Holder from turret or spindle.

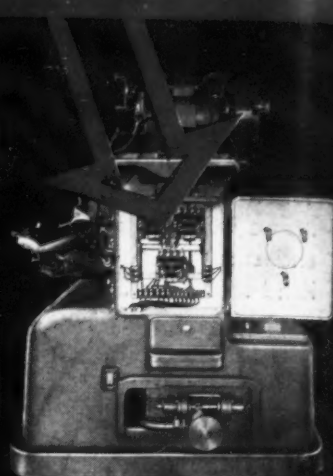
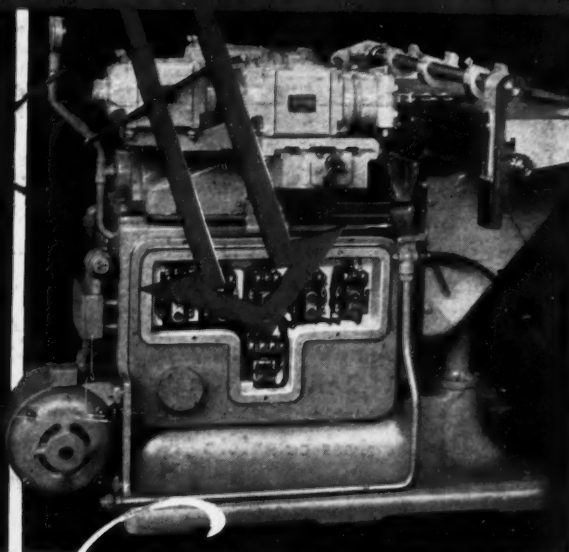
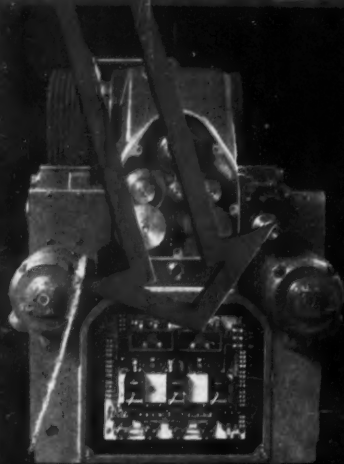


MCCROSKY TOOL CORPORATION

1340-70 Main Street MEADVILLE, PA.

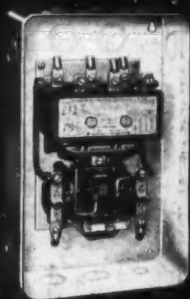
SALES OFFICES: CHICAGO, CLEVELAND, DETROIT, PHILADELPHIA, REPRESENTATIVES IN CINCINNATI, LOS ANGELES,
NEW YORK, SPRINGFIELD, MASS., ST. LOUIS, SYRACUSE, SAN FRANCISCO, TOLEDO, TULSA

For Built-in Control



Specify

BULLETIN 709 SOLENOID STARTERS



Bulletin 709 starter in standard cabinet (with cover removed) showing the generous wiring space.

★ Bulky, clapper-type starters cannot meet "built-in" specifications. They are not designed to fit into cramped spaces in machine bases or control compartments. They cannot be grouped into compact panel assemblies. Ordinary controls require troublesome slats or molded panels.

Bulletin 709 solenoid starters are designed for "built-in" service. Their compact design permits them to be fitted into cramped spaces. The solenoid construction assures maximum dependability. For instance, the overload capacity is ten times the maximum horsepower rating. No other starters offer the following "built-in" features:—

Built in 3 sizes, with or without cabinets, in capacities up to 30 hp. 220 v. 50 hp. 440-550 v.

Allen-Bradley Co., 1331 S. First St., Milwaukee, Wis.

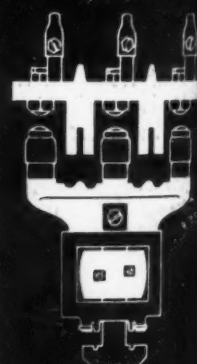
● **COMPACT**—The smallest starters for their ratings. Ideal for mounting in cramped spaces.

● **MAINTENANCE-FREE**—Double-break silver-alloy contacts never require filing or dressing. No contact maintenance.

● **CONFINED ARC**—Molded hood encloses contacts. Starters may be closely grouped on machine bases with safety.

● **EASY TO INSTALL**—Starters may be mounted on metal bases without additional insulation.

● **FRONT WIRING**—All wiring is visible and accessible from front. No back-of-panel wiring.



The low drop-out voltage eliminates unnecessary shut-downs due to poor voltage regulation.



ALLEN-BRADLEY



